SCIENTIFIC AMERICAN

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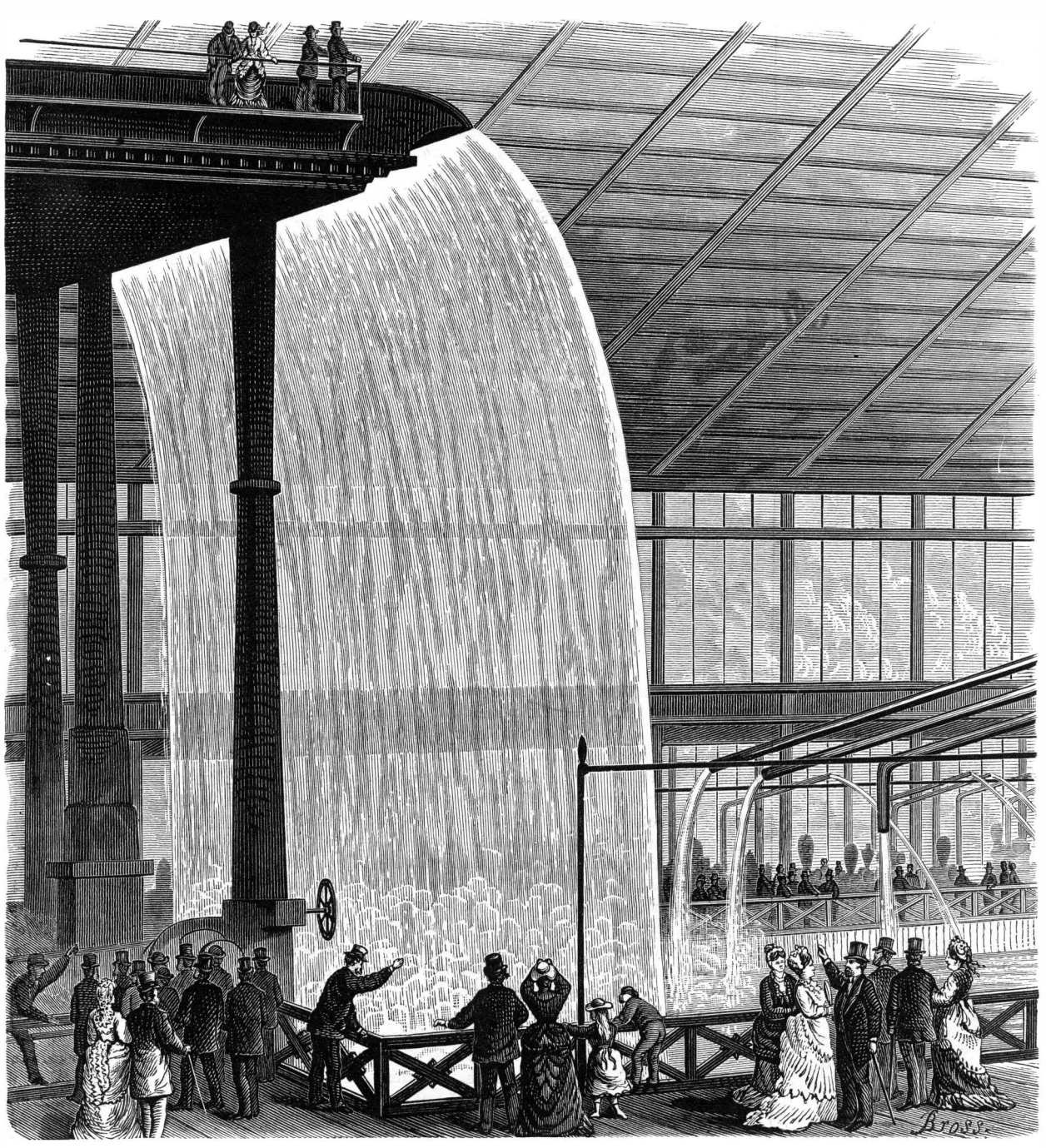
THE HYDRAULIC ANNEXE AT THE CENTENNIAL EXPOSITION.

There are few more attractive features in the Exposition than the wing or annexe of the Machinery Hall which is devoted to the display of the hydraulic apparatus. Long before the locality is reached the sound of "the rushing of mighty waters" reaches the ear, drowning the clatter of the vast area of mechanism in the vicinity; and the eye is greeted by a score of great streams, first curving majestically into the air, then lashing the waters of the huge tank below into spray; while in rear of all, a moving background of crystal and foam, falls the grand cataract. From a point behind this superb sheet of water, our artist prepared the drawing from which the annexed engraving was made. The tank is an immense brick and cement basin 146 feet long and 60 feet wide, the bottom being 8 feet below the floor of the Hall. With the water level 14 inches below the floor, it contains nearly 500,000 gallons of water, which is used over and over again in the pumps, and drawn off only when it becomes foul and unfit for use, when a new supply is let in from the mains.



THE HYDRAULIC ANNEXE AT THE CENTENNIAL EXPOSITION.

At the south end of the basin is the apparatus for testing turbine wheels, and this includes the miniature Niagara already referred to. Upon six columns, three of which are supported upon an oblong pier, erected within and near the end of the reservoir, and extending across it to within about 4 feet from each side (the other three resting on foundations within the basin) is placed a tank of boiler iron 36 feet long by 18 feet 6 inches wide and 5 feet 6 inches deep. On the side of the tank, overhanging the reservoir, is a weir overflow of the proper curved form, extending the whole length, and placed about 32 feet above the level of the main tank: by means of which weir, measurements of water discharged may be made. It holds about 19,000 gallons. The water falls over the weir into the tank in a single magnificent sheet, at the rate of 30,000 gallons per minute. This supply is maintained by two Andrews' centrifugal pumps of 100 horse power each, which are able to fill the tank every 38 seconds and to empty the main reservoir in 16⅔ minutes. The elevated tank also serves to obtain a head under which other pumps may discharge while under test. From the bottom of it is led, directly downward, a penstock tube 4 feet in diameter, and immediately under it is a cylindrical chamber of brick and cement 8 feet in diameter, built in the foundations of the tank columns. In this chamber the water wheels will be placed

Ranged along the sides of the main reservoir are numerous hand and steam pumps of all sizes, grades, and patterns, the steam apparatus having delivery pipes measuring from 1 inch to 12 inches in diameter. These pipes are represented in the engraving at about 12 feet from the floor, and projecting over into the tank. At the north end of the latter a crane pump throws a 2 inch stream of water almost to the opposite extremity. Numerous tests of the hydraulic machines are to be conducted; and the results, it is believed, will prove of great value towards determining the economy and merit of the various apparatus for raising water and producing power.

A GOOD bell metal consists of copper 100, tin 20 parts.

Bodily Weight and Nutrition.

Professor C. Voit, in a lecture at the Public Health Congress held at Munich, remarked: "The weight of the body has often been assumed as an infallible proof of the maintenance of the condition of the body, or of a deposition of tissue, and the food which keeps up a man's weight has been regarded as on that account satisfactorily nutritious. But the weight of the body is no criterion of the value of the food taken, because while the weight remains constant, or even increases, water may increase in the tissue and albumen and fat diminish; or there may be an increase of weight and deposition of fat, while there is also at the same time a diminution of the albumen of the body. Badly nourished people are usually not lighter than others, but their bodies contain more water and less albumen and fat than those who are well nourished. Every cattle feeder knows that cattle which are being fattened do not at first increase in weight proportionately to the food they take. And yet people commonly regard weight as of great importance in the case of men, though a butcher will not buy a carcass on the merits of its weight alone; he must know the quality of the meat.

"The subjective feeling of satisfaction is equally deceptive. The Irish peasant who consumes ten pounds of potatoes in the day feels quite satisfied, and yet is badly nourished. The bad effects of an improper dietary are often seen only after a considerable period has elapsed."

New Sulphur Mines in Nevada.

A new and extensive sulphur bed has recently been discovered in Washoe county, Nevada. The sulphur is imbedded in a light colored formation similar to steatite, which is half a mile in width, and can be traced north and south for about a mile. The mine has been opened to a depth of some 20 feet, and the sulphur is abundantly met with in the shape of crystalized bunches. It assays about 75 per cent of the pure article, and is worth $50 a tun in San Francisco. A very large yield is predicted; and owing to the proximity of the bed to the railroad, the expenses of transportation will be small.

The Universal Distribution of Chromium.

With regard to the new mineral daubretite, which has lately been observed in meteoric masses, Professor J. Lawrence Smith considers it to be a photosulphide of chromium, of the composition: sulphur, 37·62; chromium, 62·38. This, taken into consideration with the revelations of the spectroscope regarding the vapors which surround the sun, shows that chromium is largely diffused through the material of the Universe.

Experiments with Frozen Dynamite.

Some interesting experiments were recently made at the works of the British Dynamite Company at Stevenston, Ayrshire, with the view of proving that dynamite in a frozen state is as safe to handle and to transport as in an unfrozen state. Professors James Thomson and Bottomley, of the University of Glasgow, were present. In the first experiment, several cartridges, in a frozen state and in some parts beginning to thaw, were thrown one by one from the hand, with great force, against an iron plate without explosion. In the second experiment, a block of iron, of about 400 lbs. weight, was allowed to fall from a hight of about 20 feet on a light wooden box containing 20 lbs. of dynamite cartridges in a frozen state, and with slight signs of incipient thawing in spots more exposed to the warmth of the air. The box was smashed, and the cartridges were crushed flat and pounded together, but there was no explosion. The crushed cartridges were next made up into two heaps to be exploded. The ordinary detonator shatters but does not explode the frozen dynamite. The explosion was therefore effected by inserting in each heap a small unfrozen cartridge, with the ordinary detonator inserted into it, and then firing this off by a Beckford fuse. The two heaps were exploded successively, and it is worthy of remark that the explosion of the first, though very violent, did not set the other off, the unfrozen cartridge being the only means for effecting this purpose.

Poisons.

On April 21, the Austrian government published a decree in regard to the traffic in poisons, declaring the following substances to be included under the term poison: 1. Arsenic and all its compounds. 2. Chlorides and oxides of antimony. 8. Oxides and salts, including the chlorides, iodides, and bromides, of mercury. 4. Ordinary phosphorus. 5. Bromine. 6. Prussic acid, and preparations containing it, as also all cyanides, with the exception of those containing iron. 7. All violently active preparations made from poisonous plants and animals, or manufactured artificially, such as the alkaloids, curare, cantharides, etc.

PARAGUAY TEA.—We learn from the *Deutsche Industrie Zeitung* that Paraguay tea (*matê*) has recently been introduced into two *cafés* in Vienna, and has already found many admirers.

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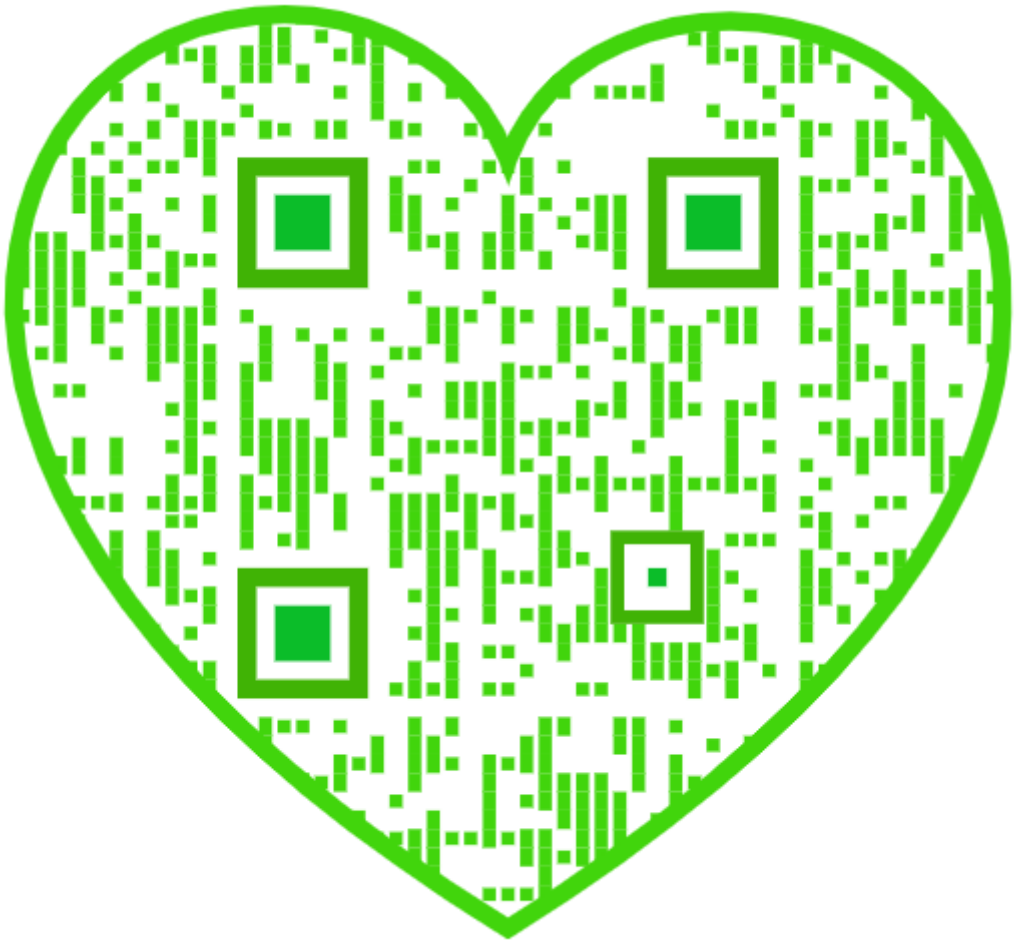

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BERTHELOT'S NEW ELECTRO-CHEMICAL DISCOVERIES.

M. Berthelot, the distinguished French chemist, has lately brought before the French Academy of Sciences a series of remarkable experiments, which, in addition to affording other results, point to an important and brilliant discovery relative to the reactions which occur between the gaseous elements of the air and the organic compounds of the earth. The nature and effect of these reactions on vegetation constitute no small portion of the science of agricultural chemistry. And regarding the question of the source of the supply of nitrogen to plants, it is well known that none is more closely enlisting the attention of chemists who find, in the doubt encircling present accepted theories, the stimulus for further and deeper investigation.

We know that, for the support of vegetation, carbon, hydrogen, oxygen, and nitrogen are needed, and that the source of carbon is the carbonic acid which exists in the atmosphere in the proportion of $\frac{1}{2500}$ of its volume. Similarly, the water always present in the air supplies hydrogen and oxygen necessary. It is not so easy to trace whence the nitrogen is derived, and here opinions have fiercely conflicted. Previous to Liebig's time, it was supposed that organic matter (humus) supplied the chief nutriment of plants; but this the great German chemist denounced as "baseless and absurd;" and after detailing his own experimental researches and those of others, he affirms that nitrogen "is derived either from the air, whence it is conveyed to the earth in rain or dew, or from organic substances accumulated from a series of generations of dead or decayed plants, or else from animal remains contained in the earth or incorporated with it by man in the form of excrements. * * * The remains of extinct animal life, which are embedded to an enormous extent in sedimentary strata, or which of themselves constitute whole masses of rock, attest the extraordinary distribution of organic life in the former ages of the earth: and it is the nitrogenous constituents of these animal bodies, passing over into ammonia and nitric acid, which still play an important part in the economy of the vegetable and animal world." Such is the present theory. It is difficult to conceive of its more complete reversal than must follow the acceptance of the facts which M. Berthelot now places before us—facts which the clearest of subsequent investigation must substantiate before they will prevail over Liebig's conclusions—facts which lead to the assertion that free atmospheric nitrogen is fixed in organic nature, unchanged in form by atmospheric electricity.

It has long been known that the silent electric discharge is capable of producing special chemical reactions. In order to study these, M. Berthelot devised a simple little apparatus, composed, first, of a bell-mouthed test tube about which a ribbon of platinum was coiled; and second, a V tube of glass closed at one extremity. The test tube filled with the gas or liquid to be tested was inserted over a mercury bath, and the closed end of the V tube was inserted in it. One pole of a Ruhmkorff coil was attached to the platinum ribbon, the other communicated with a conducting liquid (acidulated water) in the V tube. The current then passed through the then annular space comprised between the vertical leg of the V tube and the inner periphery of the test tube, which space was of course filled with the material under examination. By this instrument he found that organic compounds, at ordinary temperatures, absorb free nitrogen, while under the influence of the current. In a few hours, 15·4 grains absorbed from 0·24 to 0·3 cubic inch of nitrogen, the greater part remaining unaltered; a solid resinous polymeric product was generated, which, on being heated, decomposed with evolution of ammonia. Turpentine and marsh gas acted similarly. Taking the constituent principle of vegetable tissues—in the shape of a piece of white filtering paper, which is none other than cellulose or ligneous principle—after having slightly wet it, he submitted it to the action of the current in presence of pure nitrogen. In eight or ten hours, a notable quantity of gas had been absorbed, and subsequently the nitrogen, combined with the paper, was extracted in the state of ammonia.

The presence of oxygen does not hinder the absorption of nitrogen. By causing the discharge to act on atmospheric air in contact with a sirupy solution of dextrin, M. Berthelot observed that a certain quantity of nitrogen and oxygen combined with the organic matter. Furthermore, hydrogen is absorbed in the same manner and even more rapidly than nitrogen; 0·06 cubic inch of benzine took up 15 cubic inches of hydrogen, or about 2 equivalents, and the result of the combination was a resinous substance analogous to a dried varnish, possessing a very strong and disagreeable odor.

The reaction produced by the silent discharge appears to be much greater than when the electric spark is used. With the current the proportion of ammoniac gas reaches about 0·03 in the normal mixture of nitrogen and hydrogen; with the spark, but a few hundred-thousandths. The decomposition of ammoniac gas by the current tends to the same limit. This identity of the two limits produced by the inverse action of the current is remarkable, and is as important to be noted as that of the diversity which exists between the action of the silent discharge and that of the spark. Protoxide and binoxide of nitrogen, sulphuretted and phosphuretted hydrogen, sulphurous acid, etc., are all more or less profoundly decomposed; and in brief, the action of the silent discharge, like that of the spark, tends to resolve compound gases into their elements, with the production of phenomena of equilibrium due to the inverse tendency of recombination. Only, in the case of the discharge, a portion of the isolated elements unites with the compound itself to form condensed products, to the formation of which, however, are opposed the longer duration of the spark, and especially the heating effect thereof.

"It is not doubtful," says M. Berthelot, turning to the practical results of his discovery, "that analogous phenomena (accompanied by an absorption of oxygen) manifest themselves during storms, and even when the air is electrified or presents a different potential in its upper strata and in those exposed to the sun, which is, after all, its normal state. Under these conditions, the organic matters in contact with the air very probably absorb nitrogen and oxygen. This absorption may be revoked at the moment of lightning discharges, which correspond to the differences of tension analogous to and greater than those of the Ruhmkoff apparatus; and the same is likewise probable for weaker differences that are incessantly produced. Perhaps even this absorption of nitrogen and oxygen, joined to the molecular condensations and other chemical changes developed in the tissues under the influence of the electric discharge, causes corresponding physiological modifications which play a certain part in the singular ailments manifested in the human organism during storms."

Without stopping to dwell on these points, however, the discovery may be regarded, as we stated in the beginning, as showing a new cause for the fixing of atmospheric nitrogen in Nature. It engenders condensed nitric products, of the order of the humic principles so widely extended over the earth's surface; and however limited the effects may be, at each instant or at each point of the terrestrial superficies, they may evidently become considerable by reason of the extent and the continuity of the reaction universally and perpetually taking place.

IS THE UNIVERSE COMPOSED ENTIRELY OF HYDROGEN?

There are many eminent chemists, Professor Cooke among the number, who believe that, instead of there being 64 elements, there is but one. That this one universal element assumes more than 60 different forms (according to the velocity with which the atom moves), which constitute the molecules, or their arrangement, or number, is not more wonderful than the changes which some of our so-called elementary bodies suffer in their allotropic modifications. Sulphur, phosphorus, and carbon are, to a certain extent, protean; but they are distanced in the allotropic race by isomorphous hydrocarbons. Dr. Wurz defines organic chemistry as the chemistry of the hydrogen compounds, for he believes that it is protean hydrogen, with its ever-changing atomic volume that makes organic chemistry so complex. If we combine the two theories, that all matter is but various forms of one simple body, and that hydrogen is the most protean of our so-called elements, we have an affirmative answer to the query which forms the title of this article.

What force we shall employ to dissociate the elements and convert them into that primitive form, we are at a loss, as yet, to say; but the spectroscope leads us to think that heat, if sufficiently intense, may accomplish it. Lockyer, the great English spectroscopist, has recently been studying the spectrum of calcium, and says that when this metal is heated above a certain temperature the hydrogen line appears, as though, at that temperature, a partial dissociation took place. This fact alone is a feeble basis for the grand hypothesis that all things are hydrogen, and so too is the coincidence of the blue indium line with one of the hydrogen lines; but we shall wait for farther research, thankful that Professor Lockyer has directed our attention to that direction. The hottest known body is the sun, and about it play enormous lambient flames of hydrogen; and perhaps this unlimited supply of hydrogen is due to dissociation. Will spectroscopic astronomers tell us?

OCULAR COLOR SPECTRA AND THEIR CAUSATION.

It is a well known fact that by certain simple combinations of lines the eye can be so completely deceived as to make it altogether unreliable as a means of estimating distance and direction. Similarly, by certain grouping of masses of light and shade, the organ can be misled into recognizing apparently tangible and solid objects from mere pictorial representations. These deceptions, however, are independent of color. When that element is added a remarkable group of optical phenomena is engendered, by which the eye is led even more completely, and with less obvious reason, into error.

The reader will gain an idea of these appearances by the performance of a few simple experiments which we will indicate. On a black background, place a disk of white paper about the size of a half dollar piece. Gaze at the disk fixedly for a couple of minutes, then suddenly regard a blank white wall: when a dark spot, having the outline of the disk, will be beheld on the white surface. If a dark body on a white ground be first looked at, then, on lifting the eyes to the wall, a brilliant white figure of corresponding shape will appear, To these appearances the name negative spectra has been given; they may be considered, in fact, as genuine specters, ghosts, of the solid objects gazed on. Next, prepare from brilliantly colored paper, red, blue, yellow, and green circles. After gazing fixedly at the red circle and transferring the eyes to the wall, a green circle will appear thereon, the blue will cause a yellow specter, the yellow a blue one, the green a red, and so on, each color producing a specter of complementary hue. These are termed complementary color specter, and they may be produced in a variety of ways. Near sunset, the rays of the sun passing through an orange colored cloud cast blue shadows; the shadows of objects seen behind red curtains are green. If the sunlight be transmitted through colored glass so as to fall on white ground, the shadow of an object, placed so as to intercept the light, will have a shadow of the color complementary to that of the transmitting pane. And yet, if we look at the shadows so thrown through a tube, so as to shut

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off all else from the eye, the shadow appears without color; or, if the same shadow falls on a black surface, no shadow appears.

The theory advanced by Dr. Thomas Young, and accepted by Helmholtz and others, to explain these phenomena, asserts the existence of different susceptibilities to color rays in different portions of the retina, or among the different optic nerve filaments. Color spectra and color shadows are all explained by partial or local fatigue of the retina under impressions of light; so that the part of the retina impressed by a particular color becomes, through fatigue, less sensitive to the same color, kind, or degree of light; and therefore an impression is, during the time of that fatigue, made upon our visual consciousness only by the opposite or complementary rays: these affecting those parts or elements of the retina which are fresh not having been wearied by use. We become, in short, color blind to certain hues, while our capacity for perceiving other colors remains vigorous.

This theory has recently been revived by Professor Henry Hartshorne, and the results of that author's investigations are opposed thereto, while they have led him to suggest a new hypothesis. The more prominent experiments of Professor Hartshorne are easily repeated. It is obvious that, for the retina to become fatigued, an appreciable length of time is necessary. To show that no interval of time elapses in which fatigue can occur, it is only necessary to make a few black lines on, for example, a piece of bright green paper. Cover these lines with a sheet of very thin writing paper, such as is used, on account of its light weight, for foreign correspondence. The black lines, seen through the thin paper, at once appear red, and appear so instantaneously on the placing of the covering sheet. Any other colored paper than green may be used; the colored lines will always show the complementary color. Professor Hartshorne goes on to show that the same instantaneous color is seen in color shadows. Another experiment which he describes consists in looking at sunlight through panes of colored glass,and then turning the eyes toward a white wall. In each case a strong complementary (so-called negative) color spectrum was seen; but on closing the eyes an almost equally intense positive spectrum, having the same color as the stained glass looked through, appeared. On opening the eyes the complementary spectrum returned; on closing them, the positive one, and so on for several times in succession. This seems obviously to be quite fatal to the supposition that retinal fatigue can account for any class of spectra such as has been considered; for if ordinary luminous impressions produce temporary fatigue and loss of sensibility, stronger impressions ought to produce still greater fatigue and greater loss of sensibility: whereas the reverse is the fact.

Professor Hartshorne's hypothesis is simply as follows: The eye becomes charged, saturated,with the particular colored light, and this, having a certain strength, is neutralized by the similar colored rays in light reflected from the white surface, so that only the complementary rays of that light affect the sight. The minute retinal nerve elements respond in vibration to the luminous ether waves of the color reflected to the eyes, and are excited to motion thereby; and by irradiation or communication of vibrations, all retinal elements which have the same period of vibration are made to partake in some degree of this movement. Then, when turning from the colored object, white light, consisting of all the color rays or waves together, impinges upon the eyes; those ether waves of the white light, which belong to the color first acting on the retinal nerve elements, interfere with and for the time relatively diminish or annul the special vibrations already produced in the retina; leaving the other waves of white light to take effect upon the retinal elements which respond to or "resonate" with them, so that the complementary color only is seen.

A NEW THEORY OF HAY FEVER.

Hay fever, rose cold, peach cold, hay asthma, or autumnal catarrh—the names being indifferently applied to the same malady—is a disease which has so long baffled medical skill that a deep-rooted popular notion has been engendered that it is incurable. Having the characteristics of a cold or asthma in some respects, it differs widely from them in others, and fails to succumb to timely remedies which, in the early stages of the ordinary catarrh or cold, induce perspiration and so break up the affection. As to the nature of the strange ailment, physicians have long disagreed; but up to the present time, the dominant theory has been that suggested by Helmholtz in 1869. The German physiologist stated that he had found in the nasal secretion "certain vibrio-like bodies" (infusoria), very delicate and small, and observable only through microscopes of high power. These he endeavored to eradicate by injections of quinine solution, and met with apparent success. Helmholtz, however, experimented only upon himself, and there is a failure of evidence throughout his investigation which may justly prevent the acceptance of its results without the corroboration of much more extended inquiry.

In 1872 Dr. Morrell Wyman, of Cambridge, Mass., published a treatise on the disease in which he recognized two distinct forms, namely a "rose cold" or "June cold," occurring in May or June and corresponding to the hay asthma of England and the Continent, and a later form beginning in August and lasting several weeks into the fall, to which he gave the name of "autumnal catarrh." Subsequently Dr. Blackley, of Manchester, England, pursued a series of ingenious researches to support a theory that hay fever is caused mainly if not exclusively by the pollen of grass. The studies of Helmholtz, Wyman, and Blackley we refer to because, in point of time, they are among the latest, and for the reason that they have each been regarded as important steps toward the thorough comprehension of the malady. A new work on the subject has now just left the press, in which all previous theories are reviewed, and the results of probably the most extended investigation ever made into the causes and nature of the disease are placed before the public. The author is Dr. George M. Beard of this city, and the method in which the inquiry has been conducted, together with the facts elicited, will commend the work even to those who may not be disposed to accept the theories adduced. Following the example of Darwin and Galton, Dr. Beard prepared a series of fifty-five questions, which were designed to exhaust all sources of facts of which the majority of physicians and patients were capable of judging. From the answers, critically compared and statistically arranged, covering the circumstances of two hundred cases, the author reaches the following general conclusions:

Hay fever is essentially a neurosis, that is, a functional disease of the nervous system. In order to induce an attack there is necessary, first of all, a predisposition, frequently hereditary, to special and excessive sensibility of the nerves supplying the affected parts. All forms of the disease in all countries, whether occurring in the spring, summer, or autumn,are but manifestations of one disease, for which the most appropriate name is "summer catarrh," which may be subdivided into an early form, middle form or July cold, and the latter form or "autumnal catarrh." As the disease is not due to any single specific cause, animal or vegetable,as has been supposed, no specific will ever be found for it. The attacks may be prevented and relieved,and some remedies will act specifically on individuals; but no one remedy will ever be found to act in all cases. The leading indications in the prevention and treatment of the disease are the avoidance of light, heat, worry, dust, vegetable and animal irritants, and other exciting causes, fortifying the system by tonics before and during the attack, and relieving the symptoms by those sedatives and anodynes, locally or generally administered, which are found by experience to be best adapted for each individual case.

These indications can be met by spending the season of the attack at sea, or in elevated mountainous regions, or in high latitudes at any elevation where the air is sufficiently cool, or at the sea shore, or, for those who cannot leave their homes, in quiet, cool, closed, and darkened rooms.

For those who, in spite of these precautions or from inability to take them, are attacked with the disease, ther emedies should be quinine, arsenic, iron, and electricity, before and during the attack; local applications of quinine and camphor by the atomizer; and for palliatives, any one or several of the great variety of remedies that experiment shows to be most useful for each individual.

SHALL WE CHANGE OUR WEIGHTS AND MEASURES?

The reasons for and against making the metric weights and measures the only legal standards in this country are pretty thoroughly canvassed in the majority and minority reports of the committee of the Franklin Institute, appointed to consider the question at the request of the Boston Society of Civil Engineers.

The majority report, submitted by Messrs. Coleman Sellers and W. P. Tatham, urgently opposes the change, believing that the possible benefits to be reaped from it would not make up for the damages done during the transition; and that our government has already done all that can fairly be asked of it by making the metric system legal.

In the first place the motive for change which originally gave rise to the French system does not exist with us. There is among us nothing like the legal confusion of weights and measures which existed in France when the Bishop of Autun first proposed a reform. Our standards are few, and have the same value in California as in Maine; those which the metric system was designed to supersede were numerous, widely various, and of narrowly local use. There were, for example, thirteen different lengths of the foot, all legal, in France; eighteen legal yards, twenty-one legal pounds, twenty-four legal *bosseaux*, thirteen legal *tonneaux*, and so on; and the range of quantity represented was often enormous, as between 12,203 cubic inches and 97,980 cubic inches in the various *tonneaux*.

Then the opportunity presented to France was favorable for a change: a time of revolution, when the social order was overturned and a new political system inaugurated. Besides, the people of France had always been used to having the government interfere with their private affairs. We are not. The general government has not even undertaken to enforce compliance with existing standards, which the constitution authorizes it to fix; and if enacted, a law abolishing them and substituting the metric weights and measures would probably remain a dead letter unless enforced by means which the people would not submit to.

The argument of the committee is broken at this point by a digression in regard to the difficulties which the French experienced in bringing about the change: an interesting summary of the history of the origin and development of the metric system, but without any bearing on the present question, since the system is now complete, if not perfect, and many other countries have adopted it without any such difficulty or derangement of trade.

The objections to the meter as a standard are more cogent. It cannot be made universal. It was drawn from the circle and the sphere, yet neither of these forms will submit to the decimal metrical system. "The measurement of time, of the degrees of the circle, of navigation, geography, and astronomy, successfully rejected it, although the prime idea of the Commission was to connect these subjects with ordinary weights and measures, by making the meter(the forty-millionth part of the circumference of the earth) the unit of lineal measure, and the second (the hundred thousandth part of the day) the unit of time, by means of the pendulum beating 100,000 seconds. The meter and the second were then the intermediate links in a long chain connecting Science and practical life, having the solar system at one end and a quart measure on the other. It is singular that the parts of this chain applicable to the calculations of Science were at once abandoned for their inconvenience, and the parts applicable to the uses of yard sticks, pound weights, and quart measures were imposed upon the people by compulsory laws for nearly twenty years, without regard to the still greater inconvenience to them."

In the end a compromise had to be made for the convenience of commerce, and arbitrary standards,susceptible of divisions into halves, quarters, thirds, and so on, were authorized, "in harmony with the daily wants and usages of practical life."

Another serious objection to the meter as a standard arises from the fact that it is as arbitrary as the foot. Theoretically, it is the ten millionth part of the earth's quadrant, but the adopted length has been proved incorrect, so that the actual standard is not a definite fraction of the earth's circumference, but the arbitrary rod in the public archives. As there remains not even a sentimental reason for accepting the meter as a standard, convenience alone should determine the question of its adoption. On this point the committee hold that it is not nearly so satisfactory as the foot, while the confusion, labor, and expense of changing standards would be enormous. The meter is only decimally divided, whereas the foot, besides being divided into tenths and hundredths, is also divided into inches, giving the even half, third, fourth, fifth, sixth, tenth, twelfth, and hundredth of the foot, and the half, third, fourth, fifth, sixth, eighth, tenth, twelfth, and sixteenth of the inch.

Again, if we change our standard for the sake of uniformity with France, we must sever our uniformity with Great Britain, with which three fifths of our foreign commerce is transacted. And the change would entail a much greater expense than is usually imagined. All our land surveys have been made in acres, feet, and inches, and are so recorded in our public records with the titles to the land. "Hundreds of years would elapse before we could permit ourselves to forget these old measures." The industrial arts have of late years acquired a far greater extent and precision than ever known before, with an infinite variety of costly tools for working to exact measurements. To change our standards would necessitate a corresponding change in all these, entailing enormous loss. A new outfit for a well regulated machine shop, employing 250 workmen, for example, would cost, it has been estimated,not less than $150,000, or $600 for each workman. "If new weights and measures are to be adopted, all the scale beams in the country must be regraduated and readjusted; the thousands of tuns of brass weights, the myriads of gallon, quart, and pint measures, and of bushel, half-bushel, and peck measures, and every measuring rule and rod of every description throughout the land, must be thrown aside, and others, which the common mind cannot estimate, must be substituted." Further, "the great mass of English technical literature would become almost useless, and must be translated from a language which we, and the nation which we have the most to do with,understand perfectly, into a new tongue which is strange to most of our people." The change may seem easy enough to closet scholars who use weights and measures only in calculations; but to practical users of weights and measures, the producers and handlers of the material wealth of the country, the necessary cost of the change would vastly outweigh any possible theoretical benfit to be derived from it.

The report of the minority of the Committee, Mr. Robert Briggs, is less an argument than a vigorous protest against the positions taken by the majority, as untrue, irrational, or absurd. Mr. Briggs agrees with the majority, however, in holding that "it is inexpedient to attempt at present to anticipate by enactment the time when this great step in the progress of human civilization and unity (the adoption of the metric system) shall be taken by the national government of the United States." But he does so "solely upon the grounds of the incomplete preparation and education of the people, and their want of appreciation of the immense advantages in the progress of the arts and the applications of the sciences which the metric system presents."

The opportunity was a favorable one for presenting a strong argument for the change, based on the practical experience of those European and South American States which have adopted the metric system; and it is a pity that Mr. Briggs did not avail himself of it. Much better than any protest against the statements of the majority of the committee would have been an array of facts showing that the metric system had been adopted by countries,other than France, without the evil results predicted.

Chloride of Silver Battery.

For the last year or two Mr. Warren De la Rue, in conjunction with Mr. Spottiswoode, has been making a series of interesting experiments with a gradually increasing series of elements, whose chief interest centers in the employment of chloride of silver as the electrolyte. Starting with a thousand cells, he has increased the number to over five thousand, and has published some remarkable facts in connection therewith. It is not impossible that, some day, chloride of silver may play the part of light producer in addition to its usual well known *rôle*. The experimentalists named estimate that 100,000 of these batteries would give a spark in air of nearly three yards.

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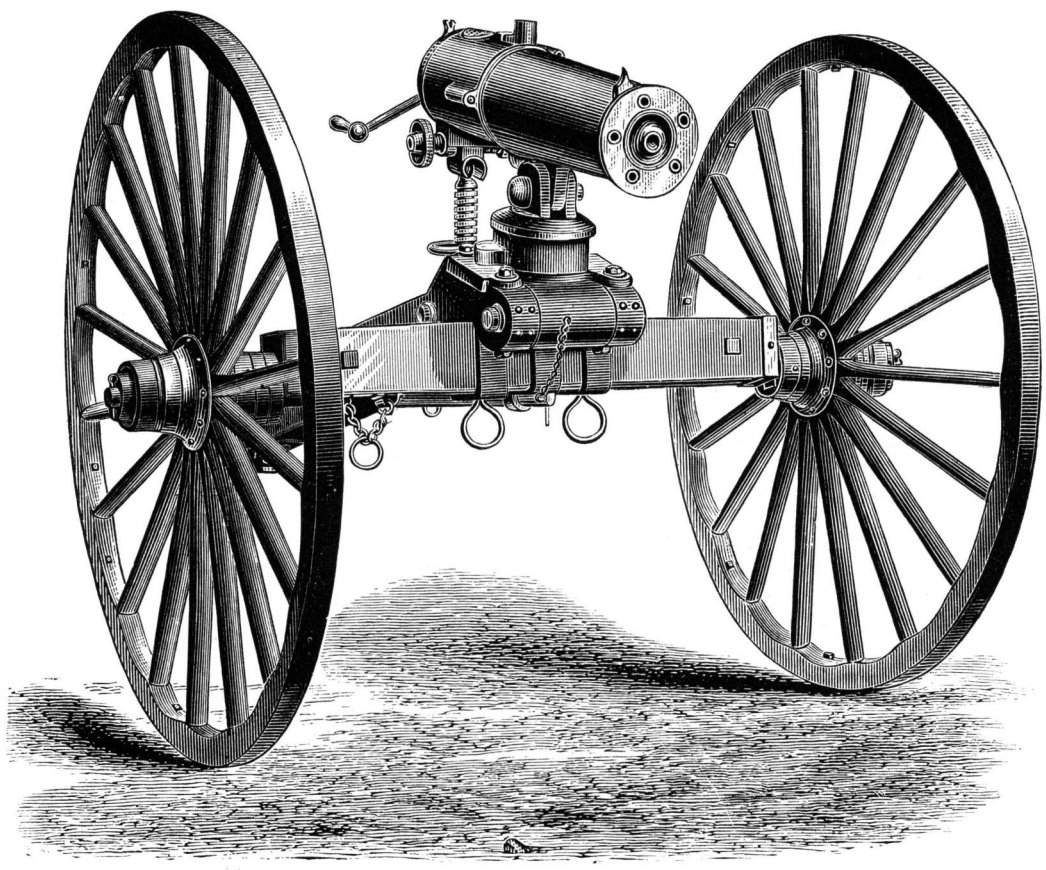
NEW GATLING GUN.

The annexed illustration represents a new and improved five-barreled Gatling gun, which, in lightness and rapidity of fire, excels any gun heretofore made on the Gatling system.

This gun weighs only 97 lbs, and fires one thousand shots per minute. It differs from the previous models in the following particulars: 1. The barrels and working mechanism are enveloped in a metal casing, which supplies the place of the frame formerly used. This casing protects the mechanism from rain, dust, rust, etc. 2. The crank is attached directly to the rear end of the main shaft, superseding the use of gearing to revolve the gun. 3. Improvement in the feed has been made, so that the cartridges are fed directly to the carrier on a central line, vertically, above the axis of the gun. These improvements can be applied to guns of ten barrels.

The manufacture of Gatling guns was commenced at Colt's Armory, Hartford, Conn., in 1866, and has there been continued uninterruptedly since. They are also made at the works of Sir W. G. Armstrong & Co., Newcastle on Tyne, England, and by Ludwig Nobel, at St. Petersburg, Russia, under agreements with the Gatling Gun Company. They have been sold to the following governments: Austria, Argentine Republic, Brazil, Bolivia, Chili, China, Costa Rica, Denmark, Egypt, Ecuador, France, Germany, Baden, Bavaria, Prussia, Great Britain, Guatemala, Hayti, Holland, Italy, Japan, Mexico, Nicaragua, Paraguay, Peru, Russia, Siam, Spain, Sweden, Switzerland, Turkey, Tunis, and the United States.

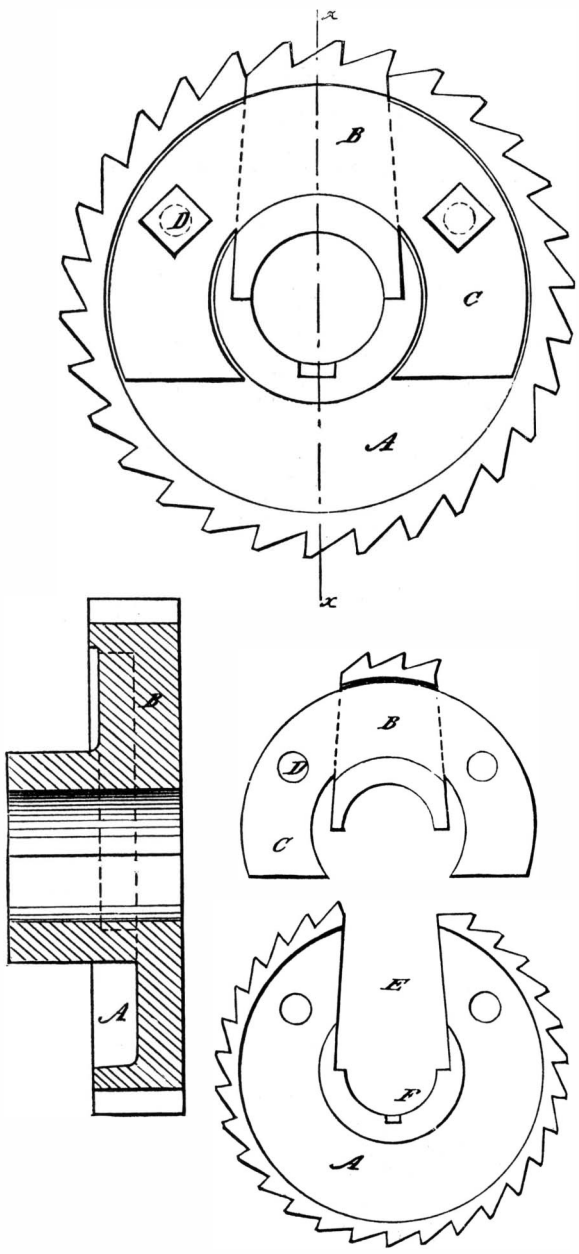
It will be seen from the above that the Gatling gun has met with remarkable success, and is destined to play no inconsiderable part in future wars.



THE LATEST IMPROVED GATLING GUN.

IMPROVED SPLIT WHEEL.

Mr. Benjamin G. Mills, of Fall River, Mass., has patented



through the Scientific American Patent Agency, April 18, 1876, an improved split gear or other wheel, so contrived that flanges on the one side of one part fit upon and are bolted to the side of the other part, to allow of applying to, and removing from, the shaft such wheels in less space than is required when they are fastened by bolting two flanges together at the sides of the wheel. One part of the wheel may also be dovetailed in the other, to sustain the expanding action of the key better than in the common way.

A is one part of the wheel, and B the other. The latter has curved flanges, C, projecting from one side, suitably for fitting against the side of part, A, so as to be secured thereto by bolts, D, when the two parts are fitted together on the shaft. The part, A, comprises nearly the whole of the wheel, being only as much less as is necessary for the notch, E, to admit the shaft to the center, F. Said notch is made in dovetail shape, so that the part, B, will be securely held against the expanding effect of the key, by which the wheel is secured to the shaft.

The Chinese Management of Roses.

It has been stated that the Chinese method of layering roses is sometimes more successful than ours. Late in the summer they select a vigorous shoot of the same year's growth and tongue it in the usual way; then put in a small pebble to keep the slit open, and bind a handful of fresh moss around the tongue, keeping it constantly dampened. In about six weeks it will have struck roots, and can be planted without disturbing the mossy covering. Many of the garden roses can be increased by suckers from the roots, which can be severed with a sharp spade in the autumn and new bushes formed of them. Budding roses is a simple process, by which amateur cultivators often increase their stock. A sharp penknife can do duty for a budding knife, and the handle of a toothbrush, if ground down smoothly, will answer for a spud to aid in lifting the bark. From the last of June to the last of August is the best time for this process, as the bark can then be more easily raised from the wood. Take a smooth stalk and make a horizontal cut across the bark, through to the wood, but not into it. From the center of this cross cut make another cut straight down the stem, an inch or more in length. These two cuts should resemble a T. Slice off the bud you desire to propagate with one cut of the penknife, cutting it close to the main stalk. Now, with the edge of the spud turn back the bark on each side of the straight cut and insert the bud on the wood of the branch to be budded, fitting it tightly to be crossed cut. With a bit of soft yarn bind down the bark, leaving the point of the bud exposed. A handful of dampened moss must then be bound round the stem, taking care to leave the tiny point of the bud exposed to the air. In six weeks the wrappings can be removed, but all other shoots must be kept from growing on the budded branch. By this means a rosebush can be made to bear half a dozen different colored roses.

Gigantic Advertising.

Probably the largest advertisement in the world is that of the *Glasgow News*, which displays its name on the slope of the Ardenlee, Scotland. The length of each letter is 40 feet; the total length of the line is 323 feet, and the area covered is 14,845 feet. The borders of the letters are sown with a pure white flower, the center is set with dwarf beet, the dark purple of which shows well at a distance, and on each side of this there is a row of light purple candytuft.

Dangerous Vails.

Ladies in traveling at this season of the year frequently wear vails of gauze, most commonly light green in color. It appears that the use of these is not wholy safe; as a case has lately been published of a child, in Troy, N. Y., whose face while asleep was covered with a green vail to protect it from flies. The infant managed to get the fabric in its mouth, sucked it, and died shortly afterward, with all the symptoms of poisoning.

IMPROVED MORTISING MACHINE.

We illustrate herewith an improved machine for cutting mortises in all work not too heavy to be raised to the chisel by the table, including sash, doors, blinds, carpentry and joinery work in general, furniture, carriage work, etc.

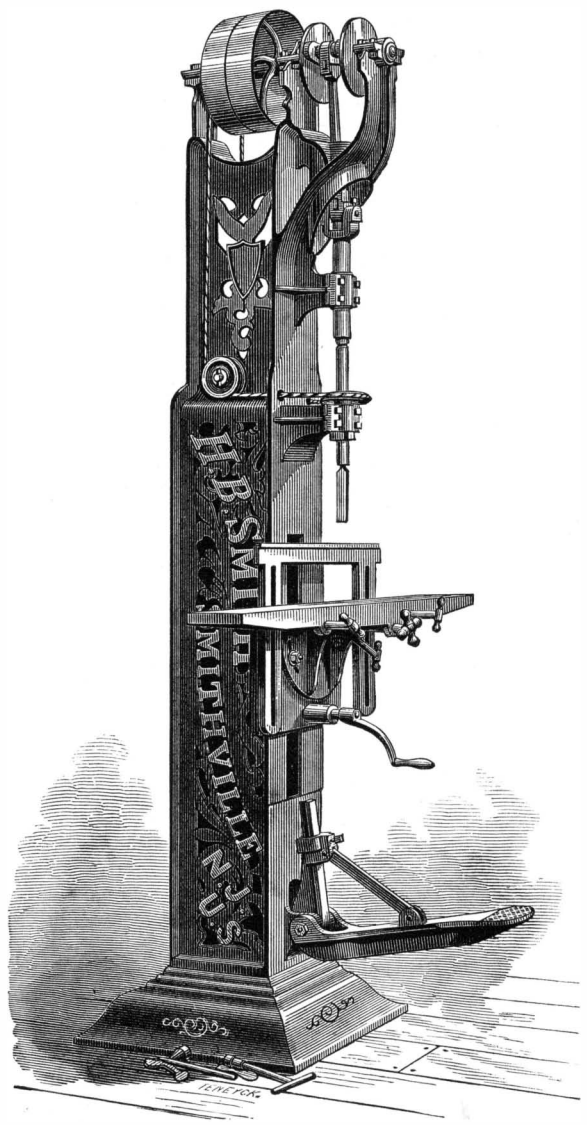
The frame, table, and attached parts are of cast iron, very strong and heavy. The running and reciprocating parts are of the best cast steel, as light as is compatible with strength and durability. The high velocity of 700 to 800 strokes per minute is attained with but little vibration; and as the crank shaft is provided with an outside bearing, the thrust being direct from the crank pin to the mortise, the machine is capable of driving an inch chisel into hard wood without boring. The method of applying this extra bearing prevents injury by careless workmen, both to themselves and to the machine. All boxes are of bell metal, and that in the reversing cylinder is split and made adjustable with screws, to correct any inaccuracy.

A practical trial of over twenty years, we are informed, has proved the efficacy of the device for reversing the chisel. It turns the chisel promptly, by power, with a scarcely perceptible motion of the treadle, and holds it true, regardless of wear or inequalities in the timber being worked.

The destructive effects upon joints in reciprocating parts has been duly considered in the design, and but three joints are employed in the reciprocating parts, it being impossible to have less and to allow the chisel to turn.

The table tips to mortise on any angle required; and when desired, a rack and pinion feed and boring apparatus are attached. To insure accuracy and cheap production, special tools are used in the construction of this machine; and the running parts and boxes are made to gage, and can be duplicated.

Many hundreds of the old style of this mortiser, embodying the same reversing device, we are informed, are now in use. The machine illustrated can be seen in daily operation at the Centennial Exposition. One is in the space of the manufacturer, in Machinery Hall, section B 7, columns 47 and 48, and another in the adjoining wood shop of the Commission, which is fitted up with machinery of the same maker



Further particulars can be obtained by addressing H. B. Smith, Smithville, Burlington county, N. J.

ONE pound of coke evaporates 9 lbs. water; 1 lb. of coal, the same; 1 lb. slack, 4 lbs. water; 1 lb. oak (dry) 4½ lbs. water; 1 lb. pine, 2½ lbs. water.

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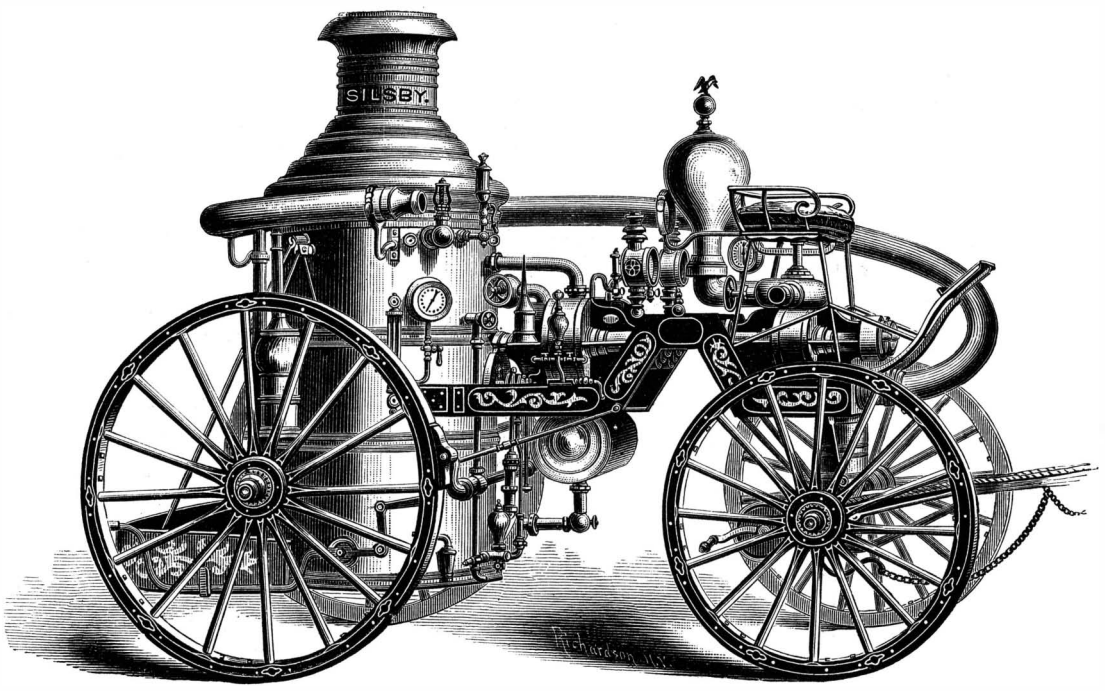
IMPROVEMENTS IN FIRE ENGINES.

The old controversy as to the merits of rotary pumps is likely to be revived at Philadelphia, when the comparative excellence of the fire engines on exhibition has to be decided by the judges. The Silsby Manufacturing Company, who have constructed the machine shown in Fig. 1, make use of the Holly pump, as shown in Figs. 2 and 3. For the rotary pump, as for the rotary steam engine, many points may be urged to demonstrate the superiority of the rotary over the reciprocating principle, such as continuous action, diminished wear and tear, and the absence of jarring and jerking, which are especially to be avoided in fire engines, as they seriously diminish the effect of the machine. But again, as in the case of the rotary engine, the results attained by the rotary pumps have been exceeded by those of their reciprocating rivals. If, however, practical trials bear out the claim of the Silsby Company for this machine, a considerable step in the improvement of the fire engine will have been made.



SILSBY'S ROTARY STEAM FIRE ENGINE.—Fig. 1.

The construction of the Holly pump is shown in the sectional view, Fig. 2. The steam enters at A, and passes out at B, turning the two revolvers, *c* and *d*, in its passage. The sides of these revolvers are packed, as shown, by blocks of metal inserted in grooves in the long cogs, and kept out by the momentum of the cams, assisted by springs. The ends of the revolvers are ground to the ends of the cylinders in which they turn. The pump is precisely like the engine, the revolvers being carried around by gears on the outside of the cylinder, to save wear. The revolution of the cams draws the water in at A, as shown by the arrows, again converging the advancing streams at the discharge, B.

The improvement on this pump made by the Silsby Company is shown in Fig. 3, three toes being added to each rotator to insure perfect steadiness of the emitted stream.

In Fig. 4 is shown the form of boiler now used in this fire engine. The operation will be clearly understood from the engraving. The boiler, as shown, embodies some slight improvements in details, the water tubes, C, having been shortened, the smoke flues, D, lengthened, and the grate surface

Fig. 2.

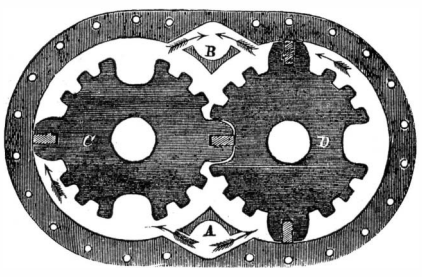
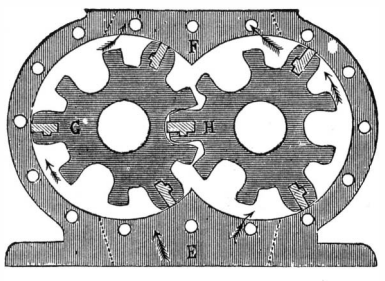


Fig. 3.



increased. One of the water tubes is shown separately at the left of the engraving.

We are indebted to the *Polytechnic Review* for the engravings.

The Nijni-Novgorod Fair.

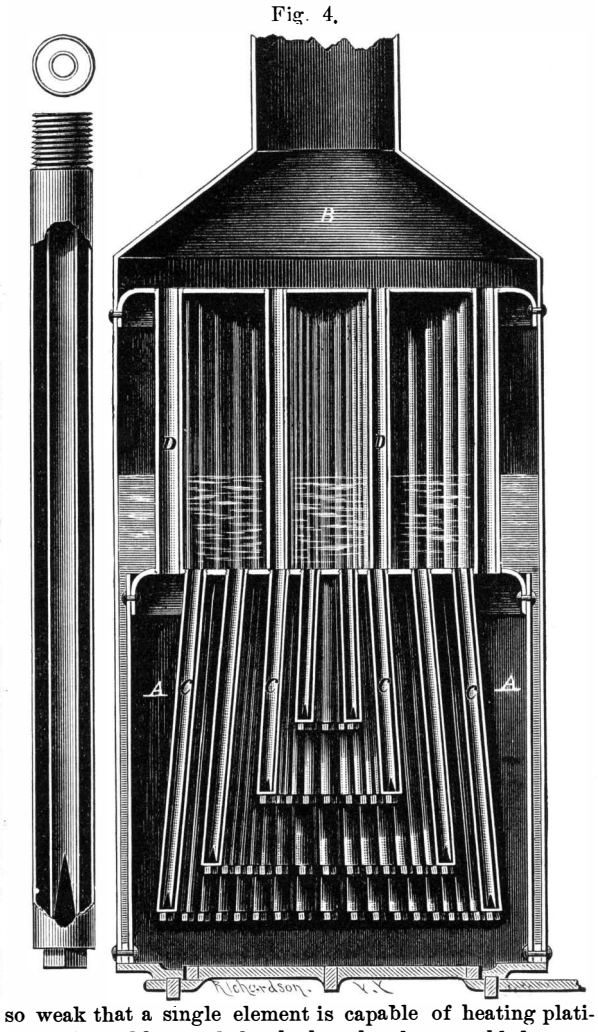
This great Russian fair. opened on June 25 (old style),and will come to a close early in September. The value of the merchandise actually sold at the fair has risen to nearly $10,000,000. Tea was sold last year to the value of upwards of $600,000. Along the banks of the lake enormous pyramids of chests of tea are heaped upon the ground, covered only with matting made from the inner bark of the birch tree. These chests of tea, called "tsibiki," are so packed as to be impervious to rain or damp. Outside the ordinary wooden chest is a covering of wickerwork of cane or bamboo, round which, at Kiakhta, raw bull hides are tightly stretched, with the hair inwards. These chests arrive at Nijni from China, having been received in barter on the Chinese border of Russia, for Russian manufactures of cotton or wool. It is these "tsibiki" which contain that peculiar Kiakhta and Baikhoff tea, whose taste and aroma are unequaled by any other kind of tea imported into Europe from China. But Kiakhta tea now encounters a formidable rival in the tea imported through the Suez Canal and Odessa, as well as from England, and which bears the name of Canton tea. Articles of almost every description are sold, also large sales are made of corn, leather, fruits from Persia, of madder and wine from the Caucasus,and of cotton and skins from Bokhara

The Improved Leclanche Battery.

The Leclanché element, which is now widely used, is, as is well known, composed of a mixture of peroxide of manganese and crushed retort carbon, inclosed in a porous vase around a large carbon plate. The vase is plunged in a solution of sal ammoniac, and a rod of zinc serves as the positive electrode. With this combination the expenditure of zinc occurs when the circuit is closed and is proportional to the work of the battery. Depolarization is effected as in other batteries, by the disoxygenation of the peroxide.

It often happens that this element presents a resistance quite considerable, which it is desirable to diminish. This, M. Leclanché states, he has succeeded in accomplishing, and he has already constructed over 30,000 elements of the improved battery for French railroads. The mixture which has given the best results is formed of 40 per cent peroxide, 55 of retort carbon, and 5 of resin (gum lac). These ingredients being intimately mingled are introduced into a steel mold capable of withstanding a pressure of 300 atmospheres, and are heated to 212° Fah. The whole is then reduced to a solid state by the hydraulic press. The electricity of this mass may be easily collected by a small rod of carbon inclosed therein. The addition of 3 or 4 per cent of bisulphate of potassa in the interior of the agglomerate contributes towards diminishing the resistance in a notable proportion, by acting as a solvent for the oxychlorides which are deposited in the pores, and diminish the conductivity of the mass. This resistance, M. Leclanche states in his communication to the French Academy of Sciences, becomes

Fig. 4.



so weak that a single element is capable of heating platinum wire red hot, and that he has thus been enabled to apply the battery to the electric lighting of gas. The electromotive force of the new pile is about 1·5, the Daniell element being taken as unity

Wooden Pavements in London.

Some two years ago permission was granted by the city authorities to the patentees of various systems to pave so much of Cannon street as would enable the former to arrive at a definite conclusion as to their respective merits. Accordingly, in May, 1874, a piece of wood pavement, constructed on "Norton's Patent Wood Slab Pavement" system, was laid down. The slabs are 7 feet 6 inches by 3 feet, composed of wooden blocks, which are cemented together by an original watertight substance. When laid down the proprietors asserted that this substance would prove to be wholly impervious to wet, thus obviating the chief objection to other wood pavements, namely, that the surface water percolates through the interstices of the blocks, and by so doing not only rots the wood, but creates a sanitary nuisance which at times might become exceedingly dangerous. A few days ago a slab of the pavement laid down in Cannon street was lifted, in the presence of a number of gentlemen interested in the question, and an engineer informs us that, when taken up, the pavement exhibited a wear of less than one quarter of an inch, and that, when the blocks were split up to ascertain the truth of the assertion that the water would not percolate through the interstices of wood, the timber was perfectly dry, while the earth grit on which it was laid was also found to be in exactly the same condition as on the day it was first put down.—*Builder*.

A NEW SOLDERING MACHINE.

Mr, W. H. Ireland Howe, of North Salem, N. Y., has patented through the Scientific American Patent Agency (June 13) a novel improvement in soldering machines, especially suited for soldering the end seams of cans. A, in the engravings, represents the frame of the machine, to which is attached a track, B, along which the cans are to be rolled. The track is flanged along its side edges to keep the cans, C, in place upon it, and has a side inclination, to cause the

Fig. 1.

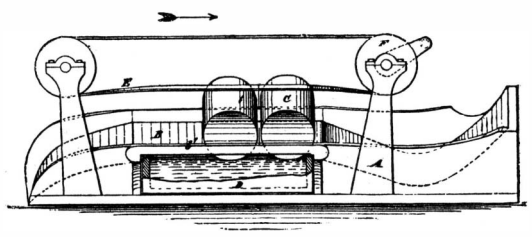
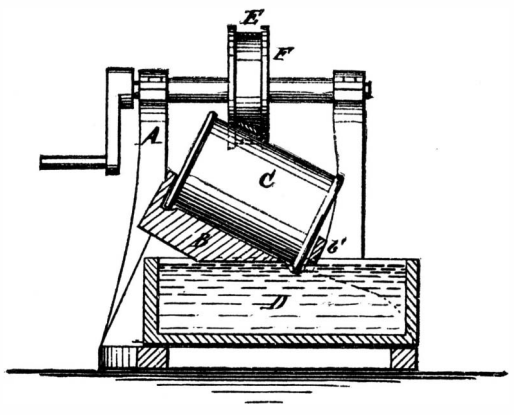


Fig. 2.



ends of said cans to rest upon the lower side flange, *b'*, as they are rolled along said track. The track, B, is slotted in the lower side of its middle part, along the flange, *b'*, to allow the end seam of the cans to project through into a solder bath, D, placed beneath it in the frame, and in which the solder is kept melted by a furnace. The bath, D, is of such a length that the cans may make at least one entire revolution with their end seams in the solder. The track, B, is made with an upward incline at one end, down which the cans are rolled in passing from the machine. The cans, C, are rolled along the track, B, by an endless band, E, which passes around the pulleys pivoted to the frame, and to one of which motion may be given by hand or other convenient power.

An Oyster on Horseback.

A tortoise was lately brought into Central Park having the shell of a full grown oyster grown upon its back. Frank Buckland recorded a similar instance in England a few years ago, and predicted that if the oyster shell were removed it would be found to have molded itself to all the rugosities of the surface of the tortoise' shell. The Central Park specimen rubbed the shell off its back a few days ago, and the pattern of the scales was found imprinted on the hard shell, showing the truth of the British naturalist's prophecy, that the valve of the oyster, which is attached to the fixed object, takes the precise form of its surface.

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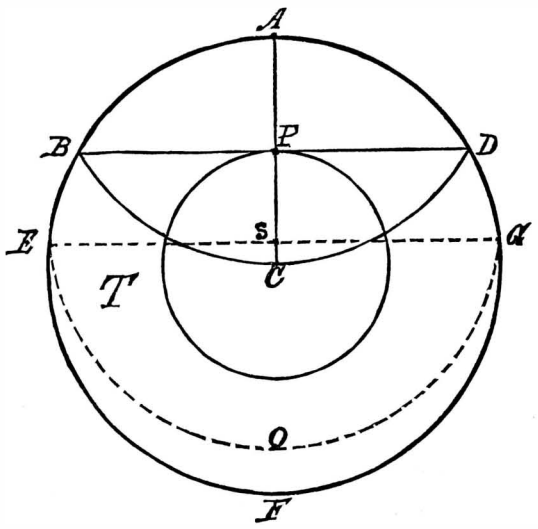
Correspondence.

Weight On and In the Earth.

To the Editor of the Scientific American:

Mr. E. B. Whitmore (page 84, current volume) denounces the ordinarily received "body in a hollow sphere doctrine" as unmistakably absurd and false. The doctrine positively declared to be false is the well known and entirely proved theorem that a hollow shell, of equally distributed matter, attracts a body placed inside of it equally in all directions. That is, a body at any depth in the earth is attracted effectively by that part only of the earth that is below that depth, the shell of matter outside of that having an equal effect in all directions, and thus no effect.



In connection with this theorem and following from it is the theorem that "a body lowered towards the center of the earth would lose in weight in proportion to its distance downward." But Mr W. says these two theorems are contradictory to each other, and illustrates by supposing a body to weigh, say, 24 lbs. at the surface of the earth, and to be lowered half way to the center. Then, he says, according to the hollow sphere doctrine, it will weigh only 3 lbs., because only one eighth of the earth's volume is nearer than the body to the earth's center; whereas, according to the other theorem, it must weigh 12 lbs., this being proportionate to the distance. But in this reckoning Mr. W. very carelessly ignores the fact that attraction is always inversely proportional to the squares of the distances from the attracting body. If the body weighing 24 lbs. is carried half way to the center of the earth, it must therefore weigh four times 24 lbs., that is 96 lbs., there, if still attracted by the whole body of the earth towards the center. But, in fact, it is attracted by only one eighth part of the earth's body, and will therefore weigh only one eighth part of 96 lbs., that is 12 lbs. And at all distances, the attraction within the earth's body, assuming the body to be of uniform density, being directly as the cubes of the distances from the center (the result of leaving out the external shell entirely, as ineffectual) and being also inversely as the squares of the distances, in consequence of the mere fact of distance, the result is that the actual effective attraction must be directly as the distances.

Another objection to the hollow sphere theorem, stated by Mr. W., is that it would follow from it that a hollow sphere would balance, as on its center of gravity, if supported at any point inside of it: whereas it will not balance unless supported at the center. Here, again, he ignores the effect of distance on the force of attraction. A hollow sphere does balance around any and every point within it, as far as the mutual attraction of its own parts towards each other is concerned. But the balancing of attraction from some other distant body, as in the case of all weights on the earth's surface, is quite another thing. J. P. PERRY.

New Ipswich, N. H.

Weight On and In the Earth.

To the Editor of the Scientific American:

Your correspondent, Mr. E. B. Whitmore (see page 64, current volume), should be more careful in pronouncing absurd a well established theorem, simply because he cannot look through it at the first glance; and he makes a serious mistake in his own conclusions. He omits to observe that the distance of P from C is equal to ½ that of A from C, and that, in order to get the attraction of the original 24 lbs. when removed to P, he should multiply the 3 lbs. of his calculation by the square of 2, and he would have found no hostilities between the old theories. His considerations, however, show the well known fact that an object at P is attracted equally strongly by the small sphere and by the lenticular mass, BFDC. HUGO BILGRAM.

Philadelphia, Pa.

Electricity and the Radiometer.

To the Editor of the Scientific American:

I have recently observed a phenomenon which is calculated to throw some light on the theory of that mysterious little instrument, Crookes' radiometer; and as, to the best of my knowledge, it has not been noticed before, I hasten to communicate it to the readers of the SCIENTIFIC AMERICAN. The radiometer used was one made by Geissler, of Bonn, and is in all respects similar to that described in the SCIENTIFIC AMERICAN, Vol. XXXII, page 392. The phenomenon and the method of observing it are as follows:

1. The glass globe of the radiometer becomes negatively electrified upon the whole of its outer surface when submitted to the radiation of the sun or any source of light, or even to obscure heat radiations of a certain intensity.

2. The presence of electricity is more sensible upon the hemisphere facing the source of radiation than the farthest removed from it.

The presence of this free electricity was determined by means of a proof plane and a Böhnenberger's electroscope, and is so easily verified that anyone possessing an electroscope of this description can verify the above statements for himself. There is no need of using a condenser, as the effects are sufficiently apparent without it. By placing the radiometer near a luminous or obscure source of radiation, and simply touching the globe, several times and in different places, with a piece of tinfoil supported on an insulated handle, and then approaching the tinfoil to the electroscope, a marked deflection of the gold leaf towards the negative pole is at once observed. If the same experiment be repeated with the radiometer when removed from the radiant source and placed in obscurity, the globe gives no signs whatever of electricity.

This manifestation of electricity cannot be attributed to the friction of the vanes of the radiometer with the rarefied air of the globe. For if the radiometer be inverted so that the vanes cannot rotate, and be then exposed to the radiant source, the same electrical effects will be produced. Several experiments, too simple to be repeated here and which, moreover, each observer will easily imagine for himself, have also convinced me that these effects cannot be attributed to a feeble evaporation on the exterior of the radiometer.

By attaching pieces of tinfoil to the electrodes and applying them to the globe of the radiometer, I have also determined that this instrument is sufficiently delicate to indicate, by a marked fluctuation, the feeble tension of a quart cell of Grenet's bichromate battery. I hope, however, to be able to give more details of this experiment in a future communication.

As your readers will observe, I have not stated to what molecular changes I believe these electrical manifestations are due. Still less do I hazard any opinion in regard to the theory which presents itself quite naturally on the mere statement of the above facts, and which seems to explain all results observed with the radiometer up to the present. This I hope to be able to do in a short time.

JOSEPH DELSAUX, S. J.,
11 Rue des Recollets, Louvain, Belgium. July 14, 1876.

Are Potato Bugs Poisonous?

To the Editor of the Scientific American:

I notice that the last issue of the SCIENTIFIC AMERICAN, in speaking of potato bugs, says that they are not poisonous. This statement ought to be taken with some qualification, I think. We have had ten years of experience with the insects in this State, and the universal impression here is that it is not safe to handle them. I have known of numerous instances wherein people have been made seriously sick by breathing the fumes where potato bugs had been thrown into the fire, or where boiling water had been poured on them to kill them. I also knew the case of a Bohemian woman who killed the bugs with her hands: and as the skin was broken slightly on one finger, an inflammation set in, which resulted in her death. Other instances might be given, equally conclusive in their bearing on the point in question. I think there can be no doubt that there is a poisonous principle in the bugs, which renders them dangerous to life and health if carelessly handled.

They can be destroyed by sifting a mixture, of 1 part pure Paris green and 20 parts of flour or ashes, on the vines when they are damp. But a better way is to put a teaspoonful of Paris green into a pailful of water, mix thoroughly, and sprinkle it on the vines. This can be done at any time of day, and there is no danger of the poison being blown into the face or eyes of the person applying it. WISCONSIN.

"POTATO PEST POISON."

BY CHARLES V. RILEY.

Several persons have recently written to get my opinion of a purported new remedy for the Colorado potato beetle, extensively advertised under the above name by the Kearney Chemical Works, 66 Cortland street, New York city. I should, on general principles, dissuade any one from purchasing a secret remedy, when a cheap, simple, and effective one is well known. Yet as there is always room for improvement, and the inventor and discoverer of something valuable has a right to profit by his discovery if he can, I am just as ready to commend as to condemn any insect remedy offered to the public, according as it merits condemnation or approval, desiring to do justice to the rights of the individual as well as of the public. What, then, is this *new* "Pest Poison," and does it represent some valuable discovery which deserves to be kept a trade secret? Or is it simply one of the many secret nostrums constantly offered to the farmer by schemers who desire to fill their own pockets? Let a candid consideration of the matter decide.

The circular of the firm claims that this "pest poison" is manufactured on "strictly scientific principles," and that it is "the only safe, sure, and cheap destroyer of potato and tomato bugs, chinch bugs, cut worms, wire worms, and army worms, caterpillars, and all insects which prey upon vegetation"! Whenever men are found making the ridiculous claim, for any substance whatever, that it is a universal cure for all noxious insects, it is safe to set them down as ignoramuses or charlatans. The habits and modes of life of insects are so varied that what may prove a perfectly satisfactory remedy against one species is often utterly worthless against another; while for successful warfare, special tactics are required in almost every case. The circular further unqualifiedly claims on one page that the poison "is not injurious to vegetation, while admitting in a special notice on another page that, if used too strong or too frequently, it injures vegetation. The truth is that many tender plants are injured by it even when used as recommended, while even stout-leaved evergreens are seriously injured when the strength of the solution is doubled. In the "directions for use" we find brief accounts of various insects, which show on their face that the authors of the circular and agents for the poison know nothing about the insects they speak of, and recommend their poison for species upon which it has never been tried. The directions under the head "Army Worm" may be taken as a sample. The passage, with the exception of the first and last sentences, is taken almost word for word, without credit, from an article of mine (New York *Tribune*, November 16, 1875); and in the sentences excepted, we are told that the army worm belongs to the "order of *noctua*!" (*noctua* is an old genus of the order *lepidoptera*), and that for this insect the solution must be made of double strength, whereas, thus made, it will injure most grasses.

The special notice closes with the following paragraph:

Furthermore, lest a prejudice should be founded on the fears of some people that the vines or crops will absorb the the poison, we have before us detailed experiments for several years past, showing that not a trace of this poison has ever been found in potatoes or grain which have been watered with this solution in much greater quantities than was necessary to destroy worms or insects, and the opinion, also, of eminent chemists, that once in the ground the poison is completely neutralized.

Here again the circular misleads, and I very much doubt whether there is a particle of truth in the statement as to the years of experience or the opinions of eminent chemists. Such language would hold true of the Paris green mixture, but not of the poison advertised. This, upon analysis, proves to be a mixture of arsenate of sodium and common salt, faintly colored with rosaniline; and as opposed to the opinions of the unnamed "eminent chemists" of the circular, I will quote the opinions of Professor Wm. K. Kedzie, of the Kansas State Agricultural College, who says that "the great objection to the use of these compounds is their extreme solubility in water. They are offered to the plant in perfect condition for absorption into its circulation; and while, in the case of Paris green, the minute proportion dissolved is at once rendered inert by the hydrated oxide of iron in the soil, it is by no means certain that the proportion of the latter is in every case sufficient to accomplish this when the arsenic compound is applied in such large quantity and in complete solution."

Last year, in my eighth report, I had something to say of a "Potato Pest Poison," manufactured by the Lodi Chemical Works of Lodi, N. J., showing that it did not work as effectually as the Paris green mixture, and that there could be no advantage to the farmer in its employment. Experiments which I have recently made show that the Kearney pest poison acts very much like its Lodi prototype, the only advantage over which it can claim being the faint coloring. The Lodi company sold a 1 lb. package for $1, which was to be dissolved in 120 gallons of water or more. The Kearney company sell a half pound package for 50 cents, which is to be dissolved in 60 gallons. Of cour e either company could get any number of testimonials as to the efficiency of their compounds. They herewith have mine. To put forth the false claim of the circular I have noticed, is simple humbug. There are plenty of farmers, gentlemen, who, rather than go to the trouble of making their own mixtures, will send for your poison packages, when they once know what your mixture is, where they would not think of ordering a secret remedy. Do not sail under false colors, or claim more than your mixture deserves: let people know that there is just as much danger, if not more, in its use, as there is in the use of Paris green in the wet method. Do this, and put your article up in more secure packages, so that the poison in deliquescing does not soak and drip through in hot weather as it now does; and I believe you will still do a good business, and deserve *not* to be ranked as charlatans.

Burns and Scalds.

The recent fearful explosion on board the British ironclad Thunderer has called out the publication of many recipes and remedies. Among them all, the following, contributed by an old and experienced physician, has the merit of convenience and readiness. The remedy is simply this: The common whiting of commerce (found in nearly every kitchen), reduced by cold water to the consistence of thick cream, is to be spread on a light linen rag, and the whole burnt surface instantly covered, and thus excluded from the action of the air. The ease it affords is instantaneous, and it only requires to be kept moist by subsequent occasional sprinklings of cold water.

Birds' Tracks in Stone.

Professor Marsh, of Yale College, is paying Dr. Field, of Franklin county, Mass., $100 a year for the right of quarrying slabs of stone showing foot prints of birds. A basket full of specimens, worth $200, was recently taken out. The specimnes are well washed, and then coated with shellac.

AMONG the new arrivals at the Central Park menagerie are two little leopards, born a week ago. They are about as large as half grown kittens and twice as clumsy. The hair is bluish gray instead of tawny yellow, as in the adults; but the black spots are well defined. In a few days they will be exposed to view.

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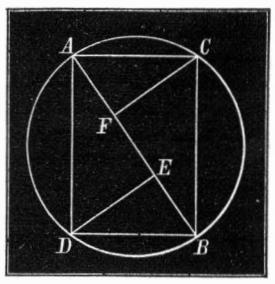
Facts and Simple Formulæ for Mechanics, Farmers, and Engineers.

The present is the best time for felling trees. For the purpose of seasoning, timber should be piled under shelter and kept dry: it should have a free circulation of air about it without being exposed to strong currents. The bottom pieces should be placed upon skids, which should be free from decay, and raised not less than two feet from the ground. A space of an inch should intervene between the pieces of the same horizontal layers, and slats or piling strips should be placed between each layer, one near each end of the pile and others at short distances, in order to keep the timber from winding. The strips should be laid one over the other, and in large piles should not be less than 1 inch thick. Each pile should contain but one kind of timber, the heavy sticks being below and the light ones on top: and the piles should be 2½ feet apart.



To cut the best beam from a log, divide the diameter, *ab*, into 3 equal parts, *af*, *fe*, and *eb*; and from *e* and *f*, draw the lines *fc*, *ed*, at right angles to *ab*. Join *ac*, *rd*, *bc*, and *bd*; then *abcd* is the cross section of the strongest beam.

To find the weight in pounds of metal objects, measure the number of cubic inches contained in the piece for wrought iron by 0·2816; cast iron 0·2607; copper, 0·32418; lead, 0·41015; brass, 0·3112.

To find the diameter of wrought iron shafting in inches to transmit a given power, multiply the indicated horse power by 65, divide by the number of revolutions per minute, and extract the cube root of the quotient: for crank shafts and prime movers, substitute 83 for 65.

In the drainage of land, the following depths and distances should be observed:

Soil.	Depth of pipes. feet	inches	Distance apart. feet.
Stiff clay	2	6	15
Friable "	2	0	18
Soft "	2	9	21
Loam with clay	3	2	21
" " gravel	3	3	27
Light loam	3	6	33
Sandy "	3	9	40
Light sand with gravel	4	0	50
Coarse gravelly sand	3	6	60

In corn mills, for each pair of stones, with all the necessary dressing machinery, etc., about 4 horse power nominal may be allowed. One pair of 4 feet stones will grind about 5 bushels of wheat per hour. Each bushel of wheat so ground per hour requires 1·11 horse power (indicated), exclusive of dressing and other machinery. Speeds in corn mills are as follows: Stones 4 feet diameter, 140 revolutions per minute; dressing machines 21 inches diameter, 450 to 500 revolutions per minute; creepers with 3½ pitch, 75 revolutions per minute. Elevator with 18 inches diameter, 40 revolutions per minute; wheat screen, 18 inches diameter, 300 to 350 revolutions per minute.

An average of 27 kinds of coal has given about 40½ cubic feet per tun.

PRACTICAL MECHANISM.

BY JOSHUA ROSE.

SECOND SERIES—Number IX.

PATTERN MAKING—TURNING TOOLS.

For finishing plain work, we have the tool shown in Fig. 62, which is the exception noted previously as being a finishing and, at the same time, a cutting tool. It is called a skew chisel, because its cutting edge is ground at an angle or askew to the center line of its length. Furthermore, it is beveled at the cutting end on both sides (as shown in the edge view), being ground very keen. It is employed for finishing straight or parallel surfaces and for dressing down the ends or down the sides of a collar or shoulder. When used for finishing straight or parallel surfaces, it performs its cutting in the center of the length of its cutting edge only, as shown at A, in Fig. 63, and is held in the position relative to the work shown in Fig. 62. When nicely sharpened it leaves a polish, unlike other finishing tools; but with these advantages, it has a drawback (and a serious one) to learners, as it seems to have a terrible propensity for tearing into the work, whether it is used upon the circumference or facing the shoulders of the work. This difficulty can only be overcome by practice, and the reason lies in the difficulty of learning how to handle the tool with dexterity. It must be held almost flat to the work; and yet, if it should get quite flat against the work, the cutting edge would cut along its whole length, and the pressure of the cut would be sufficient to force the tool edge deeper into the work than is intended, which process would continue, causing the tool to rip in and spoil the work. The face of the chisel nearest to the face of the work being operated upon stands almost parallel, with just sufficient tilt of the tool to let the cutting edge meet the work in advance of the inside face of the tool; or in other words, the amount of the tilt should be about that of the intended depth of the cut; so that, when the cutting edge of the tool has entered the wood to the requisite depth, the flat face will bear against the work and form a guide to the cutting edge. The corner of the chisel which is not cutting must be kept clear of the work. Fig. 63 will convey the idea, the arrows showing the direction in which the chisel is, in each case, supposed to be traveling.

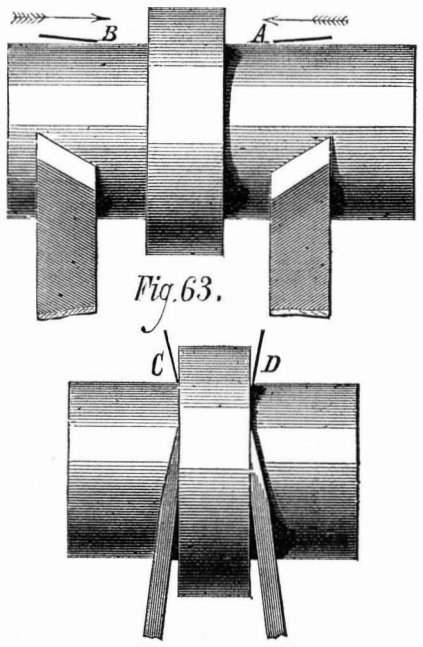


Fig. 63.

The short lines, A and B, under the arrows, and those touching the collar, at C and D, show the tilt or incline of the chisel to the work. In turning the circumference, the obtuse corner of the chisel is the cutting one; while in turning down, a side face it is the acute angle. Most pattern makers, however, do not often use the skew chisel for finishing straight cylindrical work, because it is liable to make the surface of the work more or less wavy. It is, however, almost always used for cutting off and for cutting down shoulders, for which purpose it is highly advantageous. For circumferential work on cylindrical surfaces, an ordinary chisel is mostly employed, the position in which it is held to the work causing it to scrape rather than cut. A worn out paring chisel is as good as any, but in any event it should be a short one. Such a chisel is shown in Fig. 64, the position in which it is held being illustrated by A, which represents a section of a piece of cylindrical work, B representing the chisel, and C the hand rest. Some pattern makers prefer to increase the keenness of this tool by holding it so that the plane of its length lies in the direction denoted by the dotted line, D; this, however, renders it more likely to rip into the work, and the position shown is all that is necessary, providing the cutting edge be kept properly sharpened. This chisel is also used on side faces.

Fig. 62.

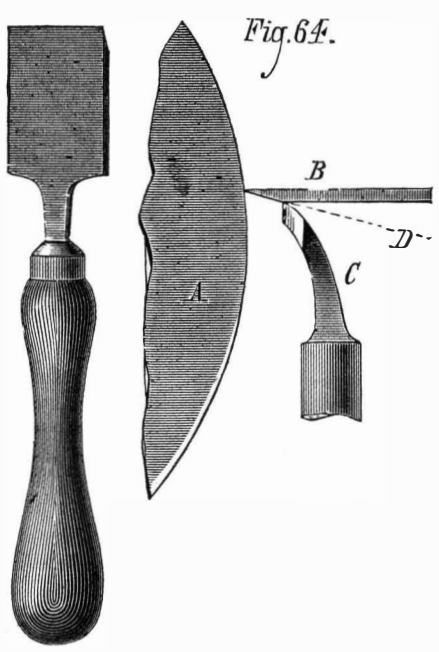


Fig. 64.

Still another tool, sometimes used for finishing plain cylindrical surfaces and side faces, is that shown in Fig. 65 at A. It is used in the same manner and relative position as the chisel shown above, in Fig. 64.

For finishing hollows, which should first be roughed out with the gouge, the form of tool shown at B, in Fig. 65, should be used. Several of these tools, of various sizes, should be kept; they are used in the same position as the finishing chisel shown in Fig. 64. The tool shown at C, in Fig. 65, is used upon large work, and is advantageous because it presents less surface of cutting edge in proportion to the depth of the cut than does the gouge; and, in consequence, it is less liable to cause the work to jar or tremble. It is usually made about 2 feet long, which enables the operator to hold it very firmly and steadily. It is used with its top face lying horizontally, and should be kept keen. D, in the same figure, represents a similar tool, with a round nose; this latter is not, however, made long, and may be used in a handle.

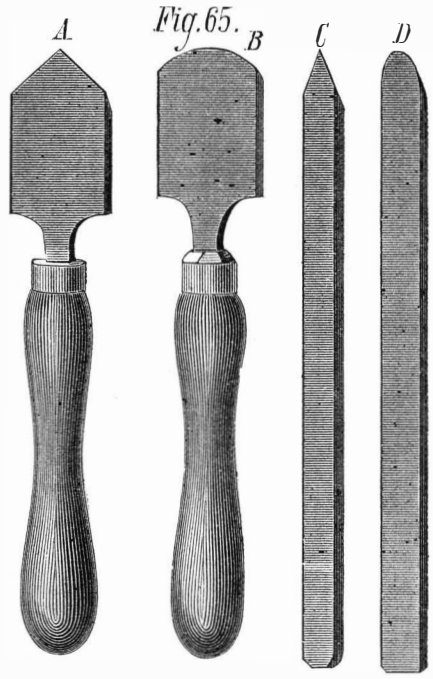


Fig. 65.

For boring purposes, the tools shown in Fig. 66 are employed; those shown at A and B, having their cutting edges at C and D, are therefore right and left hand tools. When, however, the hole is too small to admit of those tools being used, that shown at E may be employed, its cutting edge being on its end, at F.

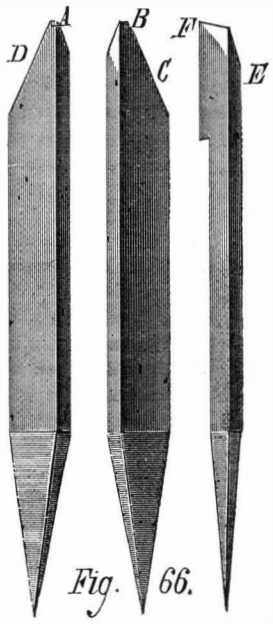


Fig. 66.

The temper of all these tools should be drawn to a light brown color, and the instruction given for grinding bench tools should be rigidly observed in grinding and oilstoning these turning tools.

A Remarkable Dwarf.

Several medical men, including Drs. Alexander Mott, J. L. Little, J. M. Merrill, E. Hudson, and S. Roof, lately visited by invitation the Mexican dwarf, Lucia Zarate, at Tony Pastor's theater in this city. These visitors said she seemed perfect in structure, healthy, and intelligent. She understands and talks Spanish and a few words of English. She is getting her second teeth; and although the doctors could not tell whether or not she was 12 years old, as claimed, they said she had teeth which she could not have under 6 years of age. She ran about, shook hands with, and talked a little to those present. She is now smaller than are many infants at the time of their birth. The following measurements were taken: Hight with shoes on, 21½ inches; length of leg from hip, 10¼ inches; around head, 13 inches; circumference of thigh, 4⅜ inches; circumference of calf of leg, 4 inches (one inch more than a man's thumb); length of shoe, 3 inches; width of shoe, 1⅛ inches. The parents of the child are with her, and are of the usual size; the mother is about the medium hight, the father, 5 feet 5 or 6 inches in hight, and quite fleshy.

THE latest improvement in mills for grinding wheat, etc., consists in the use of porcelain rollers for crushing the wheat previous to submitting it to the millstones. The result is an improvement in the quality of the flour, and a larger yield in a given time.

DETECTION OF FUCHSIN ADULTERATION IN WINE.—According to M. Jacquemin, natural red wine does not stain wool, the material regaining its white color after washing. If fuchsin be used to color the wine, however, the wool remains tinged with red.

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IMPROVED WOODWORKING MACHINERY.

A growing demand is noticed among manufacturers in wood for machines combining the functions of several different tools in one, thereby economizing space in the factory and capital in investment. These machines are, from the great range of work for which they are adapted, known as universal woodworkers.

In the manufacture of builders' material, sashes, doors, etc., as well as in the production of furniture, agricultural implements, railroad cars, patterns, etc., such machines are almost invaluable. Their true value, however, is based upon the ease with which they can be adjusted, and the facility with which the changes can be made for the different kinds of work.

The apparatus illustrated herewith combines all the features of the variety woodworkers and hand planers of the same manufacturers, with a complete molding and flooring machine. The essential features of the original Climer & Riley patent on woodworkers are all included, together with many novel and important improvements and labor-saving devices, originated by the makers.

The two sides of the machine are driven from one countershaft, which is so arranged as to convey the power to both sides simultaneously or separately, as the operator may desire. The double friction pulley on the countershaft is caused to come in contact with the driving pulleys for the cutterheads by means of two levers, one for each operator, by which he sets in motion or stops his side of the machine as he may desire. This method of obtaining independence of the combination is new and effective, as two operators can perform their work, one on each side, without either interfering with the duties of the other.

Upon the molding side, the moldings can be worked to eight inches in width, also narrow surfacing and flooring to eight inches in width. This side is furnished with a pair of powerfully geared and heavily weighted feed rollers, the motion of which can be instantly started or stopped, or given a quick or slow motion, as may be required. The inside and outside cutterheads can be swung to an angle, and have a vertical adjustment with the table to which they are attached. The under cutterhead is adjustable for different thicknesses of cut, and can be used for forming moldings on the under side of the stuff. This molding side is provided with the same features and adjustments for making accurate moldings as the molding machines of the same manufacturers, and is convenient of adjustment and adapted for simple or complicated moldings up to eight inches wide.

The primary design of the woodworker side is for dressing out of wind, and for trying up and squaring lumber. By the addition of various heads and fixtures necessary to each operation, it is rendered capable of rabbeting, jointing, beveling, gaining, chamfering, plowing, making glue joints, beading, raising panels, ripping, cross-cutting, tenoning, making circular, waved, and serpentine molding, and a great variety of work, practically limited only by the ingenuity of the operator.

The whole machine has for its support a heavy iron column, upon which all the tables are planed and gibbed to move vertically, each having a separate adjustment. The woodworker tables have a horizontal adjustment for the accommodation of different sizes of heads and cutters, the vertical adjustment being used to graduate the depth of cut for grooving, gaining, panel raising, surfacing, etc.

One of the spindle bearings on the woodworker side is cast solidly to the column, the other being movable in a planed seat, and retained in its place by a screw. This outside bearing is readily removable to allow interchange of cutterheads on the spindle, and gives the spindle a steadiness not to be acquired where the head overhangs the framing of the machine.

The tables are furnished with grooves for receiving the gaining frame slide and other attachments, and for making a continuous table by fitting in slides of the proper form. The fence is attached to and moves with the forward table, can be adjusted to an angle of 45°, and is arranged to receive stud springs for holding down the lumber, and for bolting the panel-raising attachment.

The machine is very complete in all particulars, and the desirability of the combination can hardly be called in question. This machine can be seen in daily operation at the space of J. A. Fay & Co., Machinery Hall, Centennial Buildings, section B, 8, columns 61, 62, 63. Any desired information will be furnished on application to the manufacturers, Cincinnati, Ohio

LELAND'S PIPE COUPLER.

We took occasion some time ago to bring to the notice of our readers a remarkable case of bad plumbing which came under our immediate observation. The instance was that of a wiped joint of the ordinary type used to connect lead water pipes, but through which, by blundering workmanship, the solder had been squeezed so as nearly to fill the bore of the tubes joined. The result was that great trouble was incurred in overhauling all the water pipes of the building to find why the water refused to run in the upper stories, and finally, only after large expense was incurred, the source of the difficulty was discovered. We have repeatedly expressed our opinion that wiped joints are at best badly contrived affairs, and that there is a good opportunity for inventors to devise a new method of connection for pipes which will not require fire, and solder, and skill combined to render it available. There are so many uses for such a coupling that, for one that is really cheap, simple, and capable of easy application by any one, without the aid of a plumber, a wide demand is a reasonable certainty.

Fig. 1

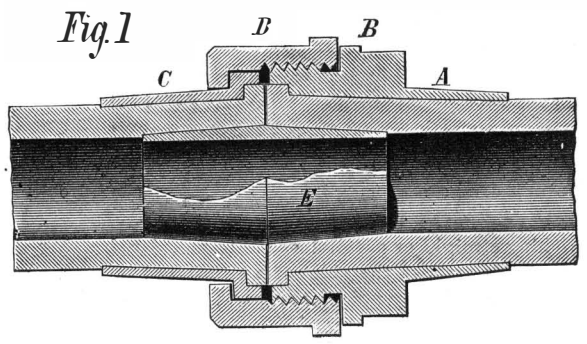
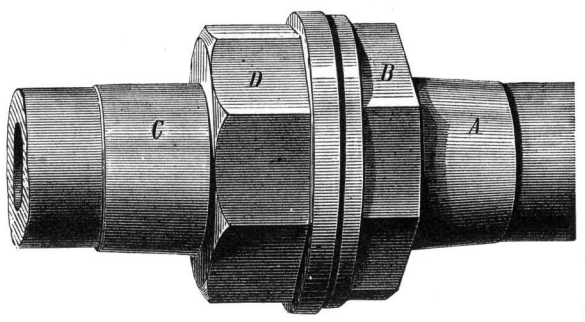


Fig. 2



In the annexed engraving is represented a device which seems to meet all the requirements as above stated, and which we can commend very highly to our readers. Its construction will be understood from the sectional view, Fig. 1, its exterior appearance from Fig. 2. It is applied as follows: A is a ferrule of brass or other suitable metal, tapered within and also having an interior shoulder. There is also an exterior collar at B, and a threaded portion adjoining. The ferrule is slipped over the end of the pipe, into the mouth of which a steel or iron shouldered tamp pin is inserted. A few blows of a hammer on the latter distends the metal of the pipe to the taper of the ferrule, and the shoulder of the tamp pin forms a facing of the pipe on the shoulder of the ferrule. On the other extremity of the pipe is applied, in precisely the same way, the ferrule, C, retained by a shoulder on which is the female union, D. A double thimble, E, of brass or iron, is then inserted in the mouth of one part of the pipe; the other end is brought over it, and the thread of the union engages with the threaded portion on the ferrule, A. By a few turns of the wrench the parts are drawn tightly together, the distended metal of the pipe itself meeting and forming the joint. The thimble simply fills up the enlargement of the bore produced by tapering the ends, and of course aids in strengthening the connection.

We have seen this coupler attached to lead pipe and secured inside of a minute and a half, and we are assured that it may be applied with nearly equal facility to the connecting of lead to iron and copper to copper, and parts of hose. It is excellently suited for use on plumbing work in houses, especially at points where both strength and a neat appearance are required. It will be found valuable in proximity to ranges or furnaces, where the heat frequently melts the solder, and will probably find an extended application on locomotives. It also is well suited to supersede the somewhat clumsy wire binding used in connecting Westinghouse brake tubes. It may be applied to attach pipes to corporation mains, without turning off the flow of water. It is extremely strong, and has been tested under the severest pressures.

Patented by E. A. Leland, February 8, 1876. For further information address the Leland Coupler Company, 36 John street, New York city.

Eating Bread and Milk with Lime Water.

Milk and lime water are now frequently prescribed by physicians in cases of dyspepsia and weakness of the stomach, and in some cases, to our knowledge, the diet has proved very beneficial. Many persons who think good bread and milk a great luxury frequently hesitate to eat it, for the reason that the milk will not digest readily. Sourness of the stomach will often follow. But the experience of many will testify that lime water and milk is not only food and medicine at an early period of life, but also at a later, when, as in the case of infants, the functions of digestion and assimilation have been seriously impaired. A stomach taxed by gluttony, irritated by improper food, inflamed by alcohol, enfeebled by disease, or otherwise unfitted for its duties, as is shown by the various symptoms attendant upon indigestion, dyspepsia, diarrhœa, dysentery, and fever, will resume its work and do it energetically on an exclusive diet of bread and milk and lime water. A goblet of cow's milk, to which four tablespoonfuls of lime water have been added, will agree with almost any person, will be agreeable to the stomach when other food is oppressive, and will be digested when all else fails to afford nourishment.

The way to make lime water is to procure a few lumps of unslaked lime, put the lime in a stone jar, add water until the lime is slaked and is about the consistence of thin cream. The lime will soon settle and leave a clear and pure liquid at the top, which is lime water. As the water is taken out more should be added, and the lime should be frequently stirred up and allowed to settle.

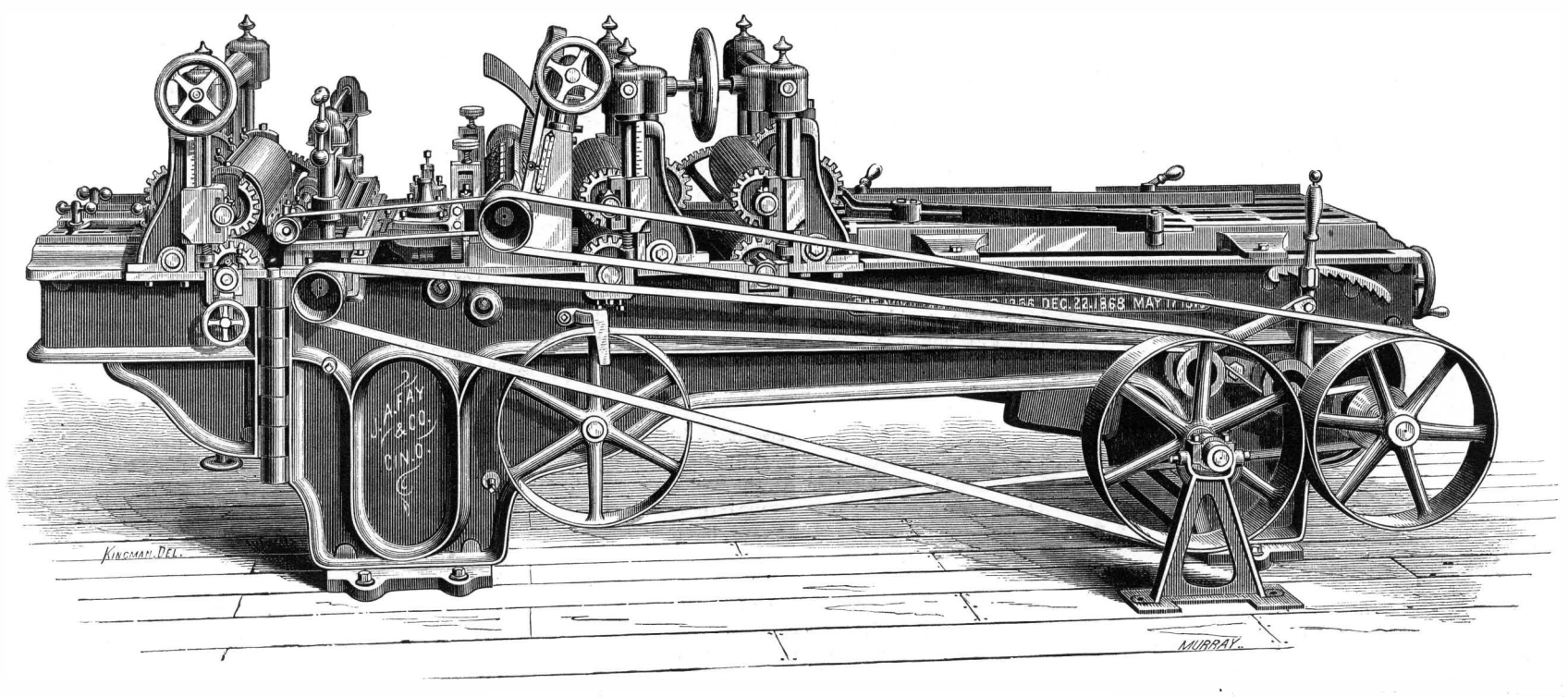
Colors for Confectionery and Food.

The police of Paris have directed that the following substances be employed for coloring articles of food or confectionery: Blue: Indigo and its derivatives, Prussian blue. Red: Cochineal, carmine, Brazil wood lake, orchil. Yellow: Saffron, Avignon yellow berry, quercitron, fustic, turmeric. Green: Mixture of Prussian blue and logwood (Campeachy wood). Violet: Mixture of carmine and Prussian blue.

The use of the following pigments is prohibited: Oxide of copper, blue copper salts, red lead, vermilion, chrome yellow, gamboge, white lead, Schweinfurt and Scheele's green (Paris green).

For coloring drinks they recommend Curaçoa logwood; for absinthe, soluble indigo blue with saffron; for blue liquids, soluble indigo blue, Prussian blue, and ultramarine.

We notice that, singularly enough, aniline colors are omitted from the list of prohibited colors.



J. A. FAY & CO.'S UNIVERSAL WOOD WORKER.

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TWO BEAUTIFUL PALMS.

Although the palm tribe, as a whole, is indigenous to the tropics, some wandering members of the family may be found as far from the equator as the south of France; and one is a native of Asia, and grows wild in the region north of the Himalayas, up to latitude 44° N. The latter, of which we give an engraving, is the hardy palm (*chamærops excelsa*); and the palmetta, of which four species are native to this country, is nearly related to it, as will be seen on an inspection of its foliage. The pure dark hue of its leaves, and the sturdy vigor of its general appearance, make it a highly ornamental tree in the shrubbery and plantation. Heat and abundant moisture are needed for its growth, and, like most other palms, it is capable of extensive utilization; its growth in tropical regions is enormous, and some fine specimens may be found in conservatories in our northern homes.

Another exquisite specimen of the palm genus is the *Pritchardia filifera*, of which we also give a representation; it is one of the most beautiful of the handsome family to which it belongs. All who have seen it will remember its remarkably fine appearance and the admiration which it excites. It is a native of this country, and grows farther north than any other of the palm tribe, its native habitat being the banks of the Colorado, in Arizona and New Mexico, where it bears the winter frosts without injury. It is excessively graceful in appearance, long white filaments falling from its palmate leaves, giving them the appearance of being furnished with plumes.

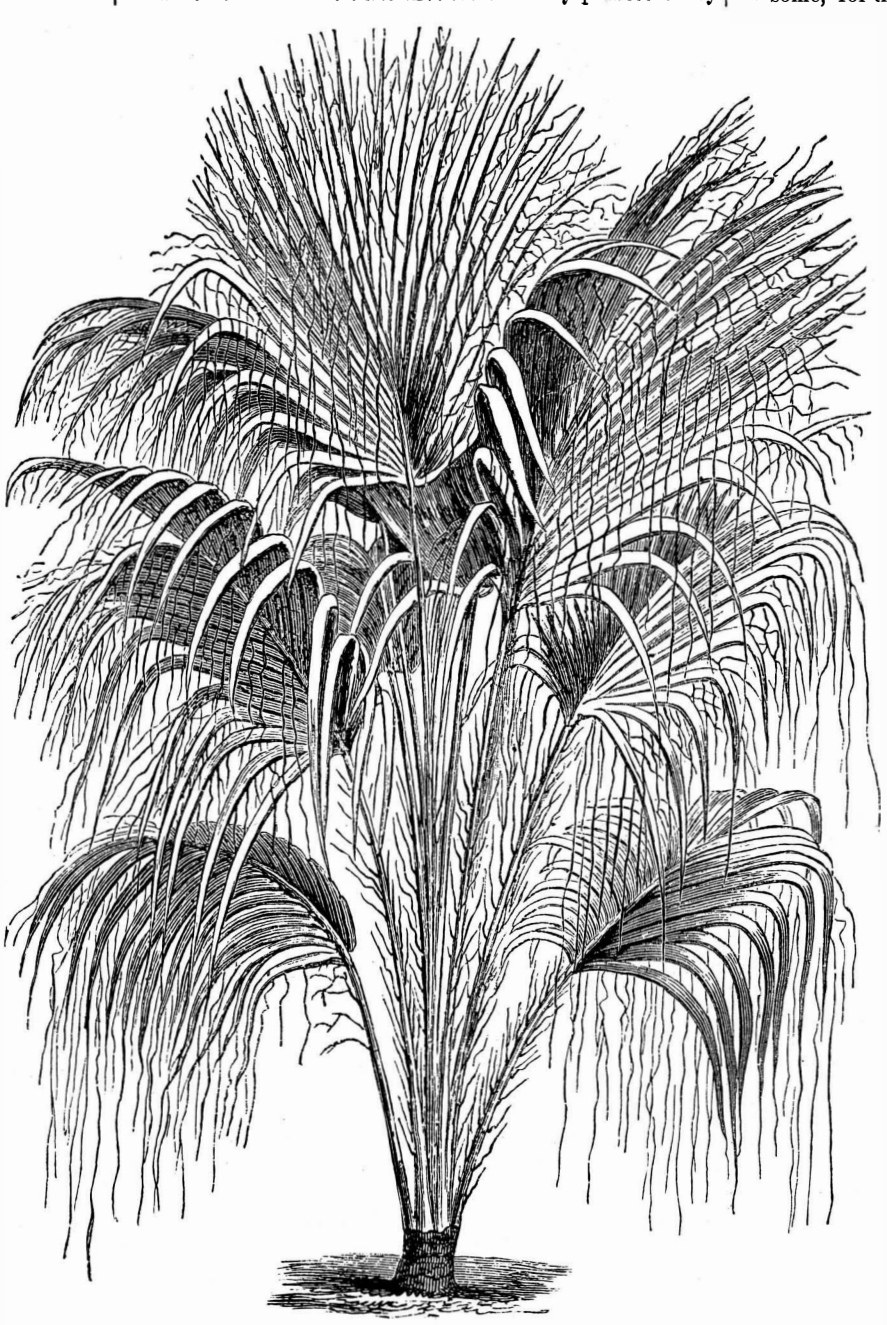
This beautiful variety of palm ought to occupy a conspicuous position, not only in private collections but also in those of public gardens. It will be found to form a good substitute for latanias, phœnixes, and similar palms, of which amateurs are rapidly beginning to get tired. In the south of Europe, says a correspondent of the English *Garden*, from the pages of which we select the engraving, it is perfectly hardy; but in more northerly climates it will succeed best under the protection of an ordinary conservatory or greenhouse.

The palm family is perhaps the most widely diversified of any botanical tribe that has distinct family characteristics; and the useful products obtainable from its members are very numerous. Houses are built of the wood, and roofed with the leaves; the fibers are used for all textile purposes; very many edible fruits are yielded by the trees; oil is extracted in prodigious quantities from one palm tree, and wine from another; and a tanning material resembling catechu is extracted from palm nuts. A common kind of sugar, called jaggery in the East Indies, is the product of a palm; and the betel nut, chewed by the natives of the Indian archipelago and elsewhere, is the fruit of a palm tree.

THE HARDY PALM (CHAMÆROPS EXCELSA

New Treatment for Cholera.

Asiatic cholera is so well known to be such a terribly fatal disease that any plan of treatment that gives promise of success must excite general interest. A method has lately been introduced by Surgeon Major A. R. Hall, of the British Army Medical Department, which, it is hoped, will lessen the mortality caused by this fearful maladay. It consists in putting sedatives under the skin, by means of a small syringe (hypodermic injection), instead of giving stimulants by the stomach. Surgeon Major Hall has served nearly twelve years in Bengal, and has suffered from the disease himself. In most accounts of the state of the patient in the cold stage, or collapse of cholera, the heart is described as being very weak, and the whole nervous system very much exhausted. Stimulants have, therefore, almost always been administered; but experience has shown that they do more harm than good. Surgeon Major Hall observed, in his own case, while his skin was blue and cold, and when he could not feel the pulse at his wrist, that his heart was beating more forcibly than usual! He therefore concluded that the want of pulse at the wrist could not depend upon want of power in the heart. A study of the works of a distinguished physiologist, Dr. Brown-Séquard, with some observations of his own, suggested the idea that the whole nervous system is intensely irritated, instead of being exhausted; and that the heart and all the arteries in the body are in a state of spasmodic contraction. The muscular walls of the heart, therefore, work violently, and squeeze the cavities, so that the whole organ is smaller than it ought to be; but it cannot dilate as usual, and so cannot receive much blood to pump to the wrist. Surgeon Major Hall looks upon the vomiting and purging as of secondary importance, but directs special attention to the spasmodic condition of the heart and lungs. The frequent vomiting causes anything that is given by the mouth to be immediately rejected; so it occurred to him, as the nervous system appeared to want soothing instead of stimulating, that powerful sedatives, put under the skin, would prove beneficial. A solution of chloral hydrate (which has a very depressing action on the heart) was employed in twenty cases where the patients were either in collapse or approaching it, and eighteen of these recovered. They were natives of Bengal. It is probable that, among Europeans, in severe cases, more powerful depressents may be required; and Surgeon Major Hall recommends the employment of solutions of prussic acid, Calabar bean, bromide of potassium, and other sedatives. Opium (which is not really a sedative, but a stimulating narcotic) and all alcoholic stimulants are to be avoided, and nothing given to the patient to drink, in collapse, except cold water, of which he may have as much as he likes. It is to be hoped that this sedative treatment may have an extended trial, and that before long we may have further favorable reports concerning it.—*Chambers' Journal.*



PRITCHARDIA FILIFERA-

Ozone.---What is it?

A certain seaside town has been considerably puffed into notoriety as a suitable resort for persons seeking health, on account of the quantity of ozone in the atmosphere. We will not dispute the fact, but it may be doubted whether one seaside town more than another naturally possesses any specially large amount of ozone. What, however, is ozone? That is a question more easily asked than answered. It appears to be a highly concentrated condition of the oxygen which forms the peculiarly vital part of the atmosphere, and is produced through electrical agency. The mechanical action of pure air over vegetation is productive of ozone, but still more manifestly is this subtle quality produced by the dashing of waves and spray against the air. These lashings of air and sea mixed are, electrically speaking, in the nature of one substance rubbing on another. They evoke ozone, which, being inhaled in breathing, gives a stimulus to the constitution. Hence the benefit to health from a sea voyage, or a residence at a pleasant sea side resort. Mr. Binney stated, at a recent meeting of the Manchester (England) Literary and Philosophical Society, that the atmosphere of towns may be sensibly ozonized, and of course improved in quality by the action of public fountains. He says: "A water fountain may be regarded as a hydro-electric machine, the friction of the water issuing through the jets developing electric action, materially assisted by the conversion of the spray into aqueous vapor. I would suggest that this fact should be prominently brought before municipal bodies, to induce them to erect fountains in all available places in large cities, as sanitary agents. They might prove highly beneficial in crowded localities." It need only be added that the delicate and wholesome freshness of the air after a rattling thunder shower in summer is very much due to the development of ozone. The subject of ozone, in its various phases, is at present engaging the attention of scientific inquirers, and we may soon hear more about it.

METEORITES.

BY PROFESSOR C. A. YOUNG.

In the present article we propose to consider the so-called detonating meteors, or *bolides*, which from time to time fall upon the earth as masses of stone or metal. It may indeed be a question whether these bodies really differ from the ordinary meteors in any thing but size; many of the highest authorities think they do not. Still the fact that even during the most remarkable meteoric showers no sound has been heard, and not a single fragment has been known to reach the ground, seems to warrant us in classing the bodies by themselves, at least provisionally. They appear to bear much the same relation to the shooting stars which planets do towards comets.

As late as 1800 men of science in general were disposed to be very skeptical as to accounts of stones and iron falling from the sky, and those who admitted the fact had recourse to most curious and absurd hypotheses to account for it: some, for instance, thought the stones were formed in the air by lightning, while others maintained that they came from volcanoes on the earth or moon. Chladni, however, in 1794 published a paper upon the origin of a remarkable mass of native iron found by Pallas, the Russian explorer in Siberia, maintaining it to be meteoric, as is now universally admitted; and to strengthen his position, he went into a careful criticism of various accounts of the fall of such bodies, compiling a catalogue of some 300, and affirming their credibility. His reasoning made an impression, but still failed to enforce general assent, until in 1803 an event occurred which put an end to all skepticism. On the 26th of April in that year, a meteor exploded over the village of L'Aigle in Normandy, within 85 miles of Paris; and more than 2,000 fragments, of weights ranging from 20 pounds to a fraction of an ounce, were scattered over a region of several miles. The Academy of Sciences sent a special committee to investigate the matter. They collected specimens, took the sworn depositions of those who had witnessed the phenomena, and in their report put the reality of the occurrence beyond all possible doubt.

The phenomena which accompany the fall of these bodies are much the same as those of the shooting stars, except that they are ordinarily far more brilliant; and observers who are near the path of the meteor usually hear a rushing roar, like that of a heavy railroad train, accentuated by several cannon-like reports which are sometimes heard at a distance of a hundred miles. At each of these explosions, whose cause is only doubtfully explained the meteor changes its course or breaks into fragments. In a few instances, when the fall took place in the daytime, no luminous phenomena were seen, and in one or two cases the fall of very small aerolites has been unaccompanied by noise. Thus, in March 1859, there was a shower of little stones in Harrison county, Indiana, one of which, about as large as a marble, fell within a few feet of a man and his wife who were standing in their cabin, with no other warning than the tearing of

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the missile through the leaves of the trees. The character of the stone, and of several others which fell at the same time, removes all doubt as to their meteoric origin.

There are several instances on record of mischief done by meteors. In 1511 a monk was killed by one at Crema; in 1650 another monk at Milan; and in 1674 two sailors on a ship in the Baltic. One of the aerolites which fell at Barbotan in 1790 broke through the roof of a house and killed a peasant and a bullock.

When these bodies have fallen among the ignorant and superstitious, they have usually been regarded with great reverence, and become objects of worship. The Palladium of ancient Troy, which by some writers is described as a shapeless mass, is supposed to have been an aerolite; so also the image of Diana of Ephesus that fell down from Jupiter; and the mysterious black stone of the Kaaba at Mecca. The stone which fell at Parnallee in Southern India, in 1857, was for some time worshipped by the natives.

The number of meteoric falls is very considerable, our cabinets now containing specimens derived from nearly 300 different localities; and if we added the specimens which are supposed to be of meteoric origin, though the date of their fall is unknown, we must at least double the number. Recalling now how small a portion of all that reach the earth would ever be found, because so much of her surface is covered with water, or forest, or desert, it becomes evident that the total number of such events is to be counted by the thousand in every century. In fact, the scientific journals usually contain the notices of some five or six on the average every year.

Meteorites differ greatly in size. They seldom fall singly; but the mass which enters the atmosphere, chilled to the temperature of interplanetary space, breaks up, under the action of the sudden and intense heat generated by the resistance of the air, into fragments which, as a rule, seldom exceed 150 lbs. in weight, while the majority are much smaller, say from 20 lbs. to a few ounces. Since, however, the number of fragments is often very great, the total weight of a single meteoric mass sometimes amounts to tuns. This seems to have been the case with the shower of stones which fell at Weston, Conn., in 1807, and the more recent fall at New Concord, Ohio, in 1860.

The different specimens from the same fall of course always closely resemble each other, being merely fragments of a single mass; but aerolites from different falls differ widely in almost every respect, with however a few marked features of resemblance. They are always coated with a thin, black, highly magnetic crust formed by superficial fusion, and they invariably contain a considerable amount of iron, ranging from 20 or 25 per cent to more than 90. They may, according to Maskelyne, be broadly classified into three divisions: The iron meteorites or siderites; the stony meteorites, or aerolites (air stones); and an intermediate class, represented by exceedingly rare specimens, which consist of a honeycombed mass of iron filled in with stony matter, and are known as siderolites (steel stones.)

SIDERITES.

Compared with the aerolites, the siderites are very rare. As yet only five cases are on record in which meteoric iron has been seen to fall: at Agram in Bohemia, 1751; Dickson county, North Carolina, 1835; Braunau, Austria, 1847; Victoria, South Africa, 1862; and Maysville, California, 1873. A recent fall in Nevada is reported to have consisted of meteoric iron, but the report needs confirmation. While, however, the instances are so few in which the actual fall of iron masses has been observed, we have in our cabinets some 200 specimens of native iron, which from the circumstances under which they were found, and their resemblance to the Agram meteorite in chemical constitution and crystal structure, are pretty certainly concluded to be of meteoric origin. Such are the great masses from Orange river in the British Museum, the Red River iron from Texas in the Cabinet of Yale College, and the Ainsa iron in the Smithsonian rooms at Washington. A marked peculiarity of all meteoric iron is its alloy with a considerable quantity of nickel, varying from 5 to 15 per cent. A second characteristic consists in a peculiar crystaline structure, which is best brought out by polishing a cut surface and acting upon it with a weak acid. Quite recently, also, Graham and others have found that a large quantity of hydrogen, and smaller amounts of carbon oxide and other gases, chiefly hydrocarbons, are occluded in the pores of meteoric iron, and can be liberated by heat.

AEROLITES.

The aerolites, or stony meteorites, which form the vast majority of all that have been seen to fall, differ very widely among themselves. Some are hard and compact, while others are as friable as rottenstone. The aerolite of Bishopsville, S. C., though covered with the invariable black crust, is internally almost as white as chalk, and as light as pumice; that of Kold Bokkeveld, South Africa, on the other hand, resembles a piece of anthracite coal more than anything else; and that of Orgueil, a mass of rather coherent garden soil. The majority, however, are heavy grayish rocks, something like sandstone, made up of crystals or minute spheres of various peculiar minerals (many of which are never found in terrestrial rocks), interspersed with nodules of nickeliferous iron and cemented together by compounds of the oxides of iron. If exposed to atmospheric influence for a few years only, the mass disintegrates and falls to pieces, and this probably explains why so few aerolites have ever been found except in immediate connection with their fall. The siderites, on the other hand, remain for centuries but slightly altered.

According to Maskelyne the following 24 elements have been detected in aerolites, namely, *hydrogen, lithium, sodium, potassium, magnesium, calcium, aluminum, titanium, chromium, manganese, iron, nickel, cobalt, copper,* tin, antimony, arsenic, vanadium, phosphorus, *sulphur,* oxygen, silicon, carbon, and chlorine. Those italicized are also shown by the spectroscope to exist in the sun, together with zinc, strontium, and cadmium, which thus far have not been found in meteorites.

ORIGIN OF METEORITES.

The origin of these bodies is as yet a matter of speculation. They enter our atmosphere, however, with a velocity so great (often exceeding 20 miles per second) as to make it certain that they do not come from any terrestrial source, or even from the moon. And for the same reason, they cannot well be, as some have thought, "the minute outriders of the great family of the asteroids," for then the velocity with which they would reach us would be only the difference between their velocity and ours. It seems impossible to avoid the conclusion that their orbits must be unplanetary, not approximately circular, but very eccentric, like those of comets and the ordinary shooting stars. It may be, as Mr. Proctor has suggested, that some of them, the siderites especially, have been ejected from our own or some other sun, by some of those tremendous outbursts of solar energy which we occasionally observe with our spectroscopes; or they may have originated, as Moigno argues, in the cracking to pieces of some old and used-up world.

At present, all we know is that they come to us from the outer darkness of interstellar space. As Humboldt has said: "They present to us the solitary instance of a material connection with something which is foreign to our planet. We are astonished at being able to touch, weigh, and chemically decompose metallic and earthy masses which belong to the outer world—to celestial space—and to find in them the elements of our native earth, making it probable, as the great Newton conjectured, that the materials which belong to our group of cosmical bodies are, for the most part, the same."—*Boston Journal of Chemistry.*

Disinfectants.

A report of the medical officers of the British Privy Council and Local Government Board throws discredit upon popular notions of disinfection. The conclusion reached is that aerial disinfection, as commonly practised in the sick room, "is either useless or positively objectionable, owing to the false sense of security it is calculated to produce. To make the air of a room smell strongly of carbolic acid by scattering carbolic powder about the floor, or of chlorine by placing a tray of chloride of lime in a corner, is, so far as the destruction of specific contagia is concerned, an utterly futile proceeding. The practical result of experiments goes to prove that dry heat, when it can be applied, is the most efficient of all disinfectants; that the old plan of stopping up crevices, and fumigating with sulphur and charcoal, is more efficacious than any other proceeding with more modern disinfectants; and that the use of carbolic vavor for disinfecting purposes should be abandoned, owing to the relative feebleness and uncertainty of its action." To these medical conclusions the experience of wise nurses adds the suggestions: That no patient, who can possibly be removed, should spend night and day in the same apartment. One room may be thoroughly ventilated while the other is occupied. Many napkins, handkerchiefs, and other articles which are sent to the wash tub should go into the fire. Every particle of foul matter should be instantly removed from the sick room. All scraps of food should be at once taken away, when the patient has finished his meal. The nurses and attendants should take especial care of their own health, and strength, and cheerfulness; and above all, no fussiness should annoy the patient. Simply let the room be kept neat and comfortable, and in that mode infection is guarded against before it becomes dangerous.

Varnish for Glass.

Terquem prepares a varnish for glass on which drawings can be made, either with India ink or with ordinary ink. Four parts of gum mastic and 8 parts sandarac are placed in a well closed bottle with 8 parts of 95 per cent alcohol, and warmed on a water bath, then filtered. When used, the glass is heated to 122° to 140° and the varnish flowed over it. After the drawing is done, it is flowed with a weak solution of gum. The varnish is very hard, and on warm glass it is brilliant and transparent; but when cold it is opaque and absorbs the ink. It can be employed for putting labels on glass bottles, etc

A thin solution of gelatin applied to a plate of glass, which is supported horizontally until dry, makes a good surface for pen and ink drawings for transparencies.

Kaolin.

Kaolin is now supposed to be produced by the mechanical decomposition of mica, some recent microscopical and chemical examinations having afforded evidence all tending in that direction. Several samples also were washed and so separated into large and small particles, but in no case could any chemical difference be discerned.

Nitro-Cumic Acid.

A new photographic agent. Exposed to light, it rapidly alters to a deep red color. A solution of the substance exposed to light, deposited red amorphous flocks of an acid nature, soluble to a beautiful rich red liquid in alkaline solutions. By the action of reducing agents it yields a yellowish brown powder, which readily decomposes, while oxidising agents convert the red acid into a yellow powder.

The Probabilities of Sickness.

The business of life insurance is largely based on purely mathematical calculation, involving the laws of probabilities, the object of which is to determine, by careful comparison of extended statistical returns, and like information, the probable duration of a person's life at every year of his existence. On the tabulated results is founded the scale of premium charges, proportionate to the risk assumed. While everyone is, of course, interested in knowing how long he is likely to live, he has a more immediate and vital interest in learning how often he is likely to be sick, and for how many days per year he will probably, by ill health, be incapacitated for work.

Dr. Reginald Southey has recently been delivering a course of valuable lectures on "Individual Hygiene" in London, and in one he introduced a table of "Expectation of Sickness," which he had prepared, and which is as follows:

At 20 years of age, calculate on 4 sick days yearly.
At 20 to 30, 5 or 6 days.
At 45, 7 days.
At 50, 9 or 10 days.
At 55, 12 or 13 days.
At 60, 16 days.
At 65, 31 days.
At 70, 74 days.

Of course this refers to people of average good health, and not to those who may be afflicted with any ineradicable or chronic ailment.

The Most Useful Drugs.

According to the London *Medical Times and Gazette,* a party of ten medical men were dining together not long since, and one of them, during dessert, started the question that, supposing all present were limited in their practice to a selection of six pharmacopœial remedies, which would be chosen as being most useful, compound drugs to be excepted. Each of the party wrote the names of the six drugs he should select, and handed them to the doctor who started the enquiry. On examining the lists it was found a majority of votes were given in favor of opium, quinine, and iron; between mercury and iodide of potassium the votes were equally divided, as as they were also between ammonia and chloroform.

New Method of Testing Milk.

The *Country Gentleman* advises its readers to test their milk by pouring a given quantity into a small cup, arranged to be heated in a water bath. When the temperature of 90° is reached, the smell of garlic, putridity, fever, or udder disease will unmistakably manifest itself. If the milk is suspected of being diluted or skimmed, the sample in the cup is coagulated by rennet, the curd is compressed to expel the whey, and the curd is then weighed. By knowing the standard weight of the curd of a given quantity of milk and comparing it with the sample tested, the variation shows the amount of water that has been added, or to what extent it has been skimmed.

The Cause of Coughs.

An Italian (according to *Les Mondes*) attributes cough to the presence of a parasitic fungus in the air passages. In grave cases, this parasite multiplies, and reaches into the lung cells. Quinine has the property of stopping the development of microscopic fungi, and is therefore adapted as a remedy in the present case. Dr. L. has used with success the following powder: Chlorhydrate of quinine, 1 part; bicarbonate of soda, 1 part; gum arabic, 20 parts. The bicarbonate of soda is meant to dissolve the mucus, the gum arabic to increase the adherence of the powder on the bronchial passages. The insufflation (blowing in) of the powder should take place during a deep inspiration of the patient, so as to facilitate its penetration into the windpipe, which is the principal seat of the microscopic fungus.

A Gigantic Kitchen.

The German government has recently built a kitchen, a thousand feet long and wholly of stone and iron. It is to be used to supply food to the army during war. Its machinery is driven by two 1,800 horse power engines, and is capable of boiling down and condensing 170 oxen, grinding 350 tuns of flour, and making 300,000 loaves of bread daily. It is also able to supply enough preserved oats for a day's feeding of the horses belonging to an army corps of 280,000 men.

Arsenic from Curtains.

An English physician discovered in a lady symptoms of arsenicism. His attention was drawn to the calico lining of the chintz bed curtains. This material was of a delicate green color, and, on examination, proved to contain a very large quantity of arsenic. This lady's husband used frequently to wake in the morning suffering from nausea, with a feeling of weight and oppression about the chest, and his eyes became inflamed. These symptoms all subsided on removing the curtains.

Naval Items.

It is understood that, to reduce expenses, all officers whose services are not absolutely required on duty will be placed on waiting orders.

July 26. The following officers were ordered to the U. S. steamer Essex, now fitting out at Boston: Chief Engineer P. A. Rearick, Assistant Engineer G. B. Ransom, and Cadet Engineers Reid, Dunning, and Stivers.

July 29. Assistant Engineer J. Diamond was dismissed the service, in pursuance of the sentence of a court martial.

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[For the Scientific American.]

EXHIBITS OF FOREIGN TECHNICAL SCHOOLS AT THE CENTENNIAL.

Although technical education in Europe is far more general than in the United States, the importance of presenting its methods, for study at the exhibition, seems to have been overlooked by most of the countries represented. The exhibits from foreign technical schools, however, although quite limited in extent, possess many interesting features, and are worthy of at least a brief record. The schools represented may be classed as those for artisans, which are designed to supply, as far as possible, the place of the old apprenticeship, which now exists only in name, and the schools for engineers, in which a higher grade of education is attempted, combined with extensive practice in the details of the profession which the student proposes to adopt. It is not improbable that the directors of our own technical schools can derive many valuable hints from a study of the methods adopted abroad.

RUSSIA.

The elegant manner in which Russia displays her exhibits at the Centennial is suggestive of an imperial exhibitor, and will go far to atone for the delay in opening them to the inspection of visitors. Those persons, however, who have been accustomed to look upon Russia as the abode of barbarians will find that civilization has much to learn from her display. But at present attention must be given to the technical exhibits, which occupy a prominent place in the Russian section in Machinery Hall.

1.—*The Imperial Technical School of Moscow.*—This school, under the direct patronage of the government, is richly endowed, and is provided with ample resources for both practical and theoretical instructions. There are school workshops, in which students are instructed until they are prepared to enter the general shops, in which skilled workmen are employed and machinery is regularly manufactured for sale. The course is 3 years, and the annual expenses are $225 for students who board in the school, and $75 for day scholars. The methods adopted for practical instruction are worthy of careful study. The professors recognize the fact that practical manipulation can best be taught by proceeding in a regular system of graded steps. If, for instance, a student is to acquire a knowledge of the art of filing, he first is shown the peculiarities of different kinds of files, as illustrated by models 24 times the size of the originals. He then passes to cleaning and chipping castings, is taught to file thin edges to given lines, and is advanced, as he becomes proficient, to filing plane surfaces, two rectangular planes, planes making acute and obtuse angles with each other, cubes, and so on, through a variety of steps, the full enumeration of which must be omitted for want of space. The same system, which is briefly described above, is pursued for the course of instruction in forging, in turning in wood and metal, in fitting up machinery, and the like. The results of such a system, carefully followed, cannot fail to be most gratifying. Not the least among its meritorious features is the plan of representing cutting tools on a very large scale, so that their peculiarities can readily be recognized by the students. The cases of tools and models on a large scale, as exhibited at the Centennial, are made at this institution for sale. They would be a useful addition to any of our technical schools; and the present exhibits at least should be secured, if possible, for some one of our industrial workshops.

2.—*The Practical Technological Institute of St. Petersburgh.*—The exhibit of this school admirably supplements the one described above, the results of the methods, which are essentially the same as at the Moscow school, being practically illustrated. Thus, the consecutive tasks in finishing cast iron, wrought iron, turning, and fitting, are all displayed, the last being represented by a good assortment of machine tools, consisting of planers, lathes, slotters, drill presses, and vises. A careful examination of these tools will show that they compare quite favorably with the average work turned out from regular establishments in this country.

The course at the St. Petersburgh school covers five years, and has two departments, mechanical and chemical. In the mechanical department, 648 hours of the course are devoted to labor in the workshops. The other technical schools represented at the exhibition, of which brief mention will be made, are designed for the sons of artisans, and give instruction which is chiefly practical, with courses in elementary mathematics, physics, and drawing, such as will be of substantial service to the workman who desires to rise in his profession.

SWITZERLAND.

The Free School of St. Gall, for Merchants' and Artisans' Apprentices.—The students of this school are instructed in drawing, modern languages, book keeping, woodworking, and modeling. Specimens of their work, in wood, plaster of Paris, and clay, with drawings made by them, are exhibited.

HOLLAND.

The Artisans' School, Rotterdam.—This school is supported by subscriptions, and grants from the government. It was founded in 1869, in order to instruct boys in the rudiments of the trades which they proposed to follow. The tuition fee is merely nominal, being about ten dollars a year. The course covers a period of 3 years, and students on entering must be between the ages of 12 and 15. After they leave the school, the authorities endeavor to find places for them as workmen, and exercise a general supervision over them for five years longer. During the time they are at school, the boys are made to work at their several trades, the brazier manufacturing kettles, basins, etc.; the smith, nails, locks, etc., and so on; and each is instructed in drawing, with reference to his special profession. Numerous articles constructed by students are exhibited. A few hours every day are devoted to the study of arithmetic, algebra, geometry, and mechanics. The results of this course of instruction are stated to be most gratifying, the boys being eagerly sought after by manufacturers on leaving school, and receiving much higher wages than other boys of the same age who have not been to a practical school.

Philadelphia, Pa. R. H. B.

Incendiary Telegraph Wires.

The building of the Western Union Telegraph Company in Philadelphia recently caught fire in a curious manner. The flames broke out in the receiving box—a large cupola-like structure on the roof, into which over three hundred telegraph wires pass in their way from the operators' room to the poles in the street. The fire was quickly subdued, without material damage other than the destruction of the wires and the drenching of the building with water. Subsequent investigation into the cause gives rise to the belief that a short line wire must have touched the earth and made a return circuit, possibly communicating with a sixty-five cell Grove battery of great intensity, which speedily rendered the wire white hot, and thus ignited the adjoining woodwork.

A New Use for Iron.

One of the most incomprehensible discoveries—if it be true, which is questionable—that we have ever encountered is announced in a recent French journal by M. Massie. He says that the mere introduction of an iron bar, in the box in which barley, rice, bran, biscuit, and like farinaceous materials are stored, is sufficient to prevent either the ravages of decay or the attacks of insects. Full details of the experimental investigation are given. An iron bar 3 lbs. in weight is reputed to have protected 40 gallons of grain; and certain biscuits were preserved for seven months in excellent condition, while others, under like circumstances but without the iron, were totally destroyed by weevils.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From June 27 to July 13, 1876, inclusive.

AUTOMATIC TELEGRAPH.—R. E. House, Binghamton, N. Y.
BINDING GRAIN.—Johnson Harvester Company, Brockport, N. Y.
CHAIN SWIVEL, ETC.—V. Draper, North Attleborough, Mass.
COUPLING, ETC.—S. Poole, Boston, Mass.
FASTENING BOOT SOLES, ETC.—G. V. Sheffield *et al.*, Brooklyn, N. Y.
FLOURING PROCESS, ETC.—V. B. Ryerson, New York city.
HAMES, ETC.—W. Robinson, Newburgh, Minn.
HARVESTER.—W. E. Kelly, New Brunswick, N. J.
HORSESHOE MACHINE.—H. J. Batchelder, Fitchburg, Mass.
KNITTING MACHINERY.—M. Marshall, Lowell, Mass.
LAMP BURNER, ETC.—H. A. Chapin *et al.*, New York city.
OIL TANK, ETC.—C. A. Munger, New York city.
PREPARING FLAX, ETC.—J. Good (of Brooklyn, N. Y.), Leeds, Eng., *et al.*
RAILWAY COUPLING.—J. C. Mitchell *et al.*, Lancaster, N. H.
RAILWAY WHEEL.—W. A. Miles, Copake, N. Y.
REAPER AND MOWER.—G. Pye, Hyde Park, Mass.
REAPER COMPRESSER, ETC.—S. Johnston, Brockport, N. Y.
REDUCING IRON ORES.—T. S. Blair, Pittsburgh, Pa.
REFINING IRON, ETC.—W. Sellers, Philadelphia, Pa.
REVOLVING PISTOL.—O. Jones, Philadelphia, Pa.
SAW FILE GUIDE.—E. Roth, New Oxford, Pa.
SEAMING KNIT GOODS.—C. J. Appleton, Elizabeth, N. J.
SEWING MACHINE.—F. D. Ballou, Marlboro', Mass.
SEWING MACHINE CUTTER.—L. L. Barber, Boston, Mass.
SIGNAL, ETC.—J. Gordon, Cal.
SMELTING ZINC.—F. L. Clerc, Bethlehem, Pa.
STEAM ENGINE.—H. S. Maxim, New York city.
TRAVELLER.—S. Poole, Boston, Mass.
UMBRELLA FRAME.—R. G. Radway *et al.*, New York city.

Recent American and Foreign Patents.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED WAGON STANDARD.

Jacob Metz, Vernon, Ill.—This is an improved standard for the bolsters of wagons, so constructed that it may be readily and quickly attached and detached. It also enables a pair of bolsters to be ironed with less labor. It consists in castings bolted to the bolster and the base of the standard, connected with the said castings by tongues and grooves, and with the bolster by a spring bolt.

IMPROVED CHIMNEY AND VENTILATING FLUE.

Amos H. Bourne, Fort Scott, Kan.—This invention consists of a chimney and ventilating flue constructed of plastic material, the smoke flue being a clay pipe, which is placed in the center of the ventilator, the last being a cement case surrounding the pipe. There are four ventilating passages between, and at two opposite sides are ribs fitting in grooves of the pipe to secure it in place. The exterior case with passages is also for protecting the building from the heat of the smoke pipe.

IMPROVED SAW CLAMP.

Joseph Shelly, Mariposa, Cal.—This consists of clamping jaws, that are adjusted by stationary and sliding clamp pieces, screw bolts, and nuts, to the saw, in connection with a central spring pin, and grinding and locking bars for holding and turning circular saws in the clamp.

IMPROVED SAW MILL.

William E. Hill, Erie, Pa.—The logs are fed against the saws, and cut by the downstroke of the same, producing, by the slight inclination during the downstroke, the equal cutting of all the teeth, until at the lower part of the downstroke the saws are carried back far enough to give the sawdust a chance to drop or fall out before the saws get any perceptible upward motion. This prevents the teeth from carrying the sawdust back up into the cuts, and avoids thereby the choking or clogging of the saw teeth while coming down for the next cut. The receding of the saws from the cuts admits the regular forward feed of the logs during the rearward oscillation of the saws, and brings the saw teeth, at the completion of the upward stroke, forward again, to meet the cleared cuts and cause the cutting of the logs exactly at the commencement of the downstroke. The cutting is thus accomplished in the shortest time compatible with the clearing of the cuts. The feed rollers are geared to prevent the cant or log from rising or lowering when it feeds up.

IMPROVED FENDER FOR CAR WINDOWS.

Raphael P. Proctor, Edinburg, Va.—This improvement is in the form of a hood or funnel converging to a cylindrical tube at its lower extremity, and pivoted to a bracket beneath the car window, to adapt it to be turned to either side thereof, and then secured by a catch, which is likewise pivoted to said bracket.

NEW HOUSEHOLD INVENTIONS.

IMPROVED WELL AND CISTERN TOP.

John M. Bull, Sidney, O.—This invention consists of a platform with hinged door and recess and pump arranged at the top part of a sediment-collecting pot at the bottom of the cistern or well.

IMPROVED LAMP BRACKET FOR SEWING MACHINE TABLES

Frank T. Knauss, Scranton, Pa.—This is a folding lamp stand, arranged so as to be vertically adjustable on a bracket, which is to be attached to the sewing machine table by screwing to the under side. The object of folding the stand is to dispose of it compactly when not in use.

IMPROVED SASH FASTENER.

Gustavus H. Reck, Bethlehem, Pa.—This consists of a bolt for locking the sash, and a spring presser for holding the sash up by friction, so combined that the locking bolt is thrown out of action by the act of unlocking it and raising the sash. It does not interfere with the function of the presser, nor act upon the jamb so as to injure it, and is put in action again by the closing of the sash down. The invention also consists of a novel contrivance of the spring presser and the handle for working it, to apply the pressure and release.

IMPROVED CHAIR.

William T. Doremus, New York city.—The back frame of this chair is so constructed as to hide the springs and the devices by which the seat is connected with the pedestal.

IMPROVED WASHING MACHINE.

William H. McFarlen, Dysart, Iowa, assignor to himself and G. Aschenbrenner, of same place.—This is an improvement in that class of washing machines in which an endless carrier, formed of slats placed side by side and attached to belts, or otherwise flexibly connected, is arranged to travel in contact with one side of a rotating drum, and thus rub and cleanse the clothes by their combined action. The improvement relates to so arranging the endless carrier that it nearly encircles the drum, space only being left for the introduction and removal of the clothes.

IMPROVED LAMP REFLECTOR.

Martin P. Warner and Jabez F. Warner, Morrison, Ill.—This is a reflector covered at the reflecting surface with a thin layer of mica. The device is applied to the lamp by spring clamps at the lower end, which are bent of one piece of wire and attached by forward extending arms to the lamp at the juncture of burner and bowl.

IMPROVED OSCILLATING CHAIR.

Stephen C. Osgood, Georgetown, Mass.—In this device there is a combination of the knife-edged pivots of the seat frame with the spring-cushioned bearings of standards, to produce the giving of the seat when sitting down.

IMPROVED WASHING MACHINE.

Joseph Klein, Allentown, Pa.—This consists of a revolving endless belt made of hinged, grooved, or corrugated sections set into a wash tub, and of a reciprocating rubber with elastic ribs working thereon.

IMPROVED MOSQUITO NETS AND CANOPIES.

Mrs. C. Ballou, Watervliet, and G. G. Lee, Paw Paw, Mich.—This invention is an improvement in that class of nets or canopies which are applied to beds and other articles of household furnitur, to exclude mosquitoes, flies, and other insects, and consists of a series of folding frames having their respective arms or end bars pivoted to common centers to adapt the frames to open and close like the leaves of a fan, and in a clamping device for adjusting and holding the pivoted frames in the desired position, also in the construction of the longitudinal main bars of the frame, also in other features.

IMPROVED STOVE POLISH.

Charles H. Curfew and Alfred Hall, Fiskedale, Mass.—This is a compound of plumbago, nitrate of silver, salt, and cream of tartar, said to produce a brilliant polish with little labor.

IMPROVED MEAT TENDERER.

John Roemer, Champion, Mich.—This consists of a handle and corrugated squeezing plate, pivoted to a stationary corrugated plate by means of a vertically sliding pivot block. Over the latter is a strong spring, to allow the pivot block to rise in case the steak is thick and hard, and an adjusting stop screw to limit the rise of the pivot block, as required for steaks of different thicknesses. Under the block is a light spring, to prevent the block from dropping down too low when the steak is removed.

IMPROVED CLOTHES LINE SUPPORTER.

Smith M. Knapp, Hoboken, N. J.—This is a crank for clothes lines, so constructed that the clothes may be put upon the line within the room, so as to avoid all danger of falling out of the window while putting out or taking in the cloihes, and which will allow the window to be closed while the clothes are upon the line.

IMPROVED AUTOMATIC FAN.

Mrs. Laura E. Haack, St. Louis, Mo.—This invention consists of a spring with a gearing of spur wheels, contained in a suitable box or suitable frame, and operating a suitable fan, the said box being located in a convenient position above the bed, and supports in a detachable and peculiarly constructed frame, which consists of legs, having at the bottom forked feet, which fit upon the head and foot boards, and have in the top tenons, which fit into sockets attached to the box.

IMPROVED COOKING RANGE.

Thomas A. Carrington, Baltimore, Md.—This invention relates to an improved double cooking range, and it consists in the particular construction and arrangement of the ovens and furnaces, so arranged with respect to a common flue, and controlled by dampers, that the heat may be variously applied, at the top or bottom of the ovens, and either side of the range, with its oven and furnace operated and controlled as to its heat, independently of the other.

IMPROVED PETROLEUM COOKING STOVE.

Fredrick Hildebrandt, New York city.—The invention consists of a perforated sheet metal bedy resting directly on the lamp, and supporting an interior chimney that is connected at the top by an inverted conical diaphragm with the body. It is provided at the base with a burner-encircling cone inside of the chimney, to conduct the air both at the inside and outside of the cone to the flame of the burner.

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IMPROVED LAMP WICK ATTACHMENT.

Henry Rauschousan,Cornwall, Canada.—This consists of a clamp formed of the two plates, hinged to each other at one end, and provided with teeth on their alternate side edges, to adapt it to connect and hold the adjacent ends of two wicks.

IMPROVED LAMP CHIMNEY.

Emil Honerjaeger, Watertown, Wis.—This chimney is formed of a brass frame, having the inner edges of its top, bottom, and side strips scalloped, to hold a sheet of mica. There is besides a metal top piece. With this construction the sheet of mica will be held securely in place, and may be readily cleaned or replaced.

IMPROVED DOOR CHECK.

William J. Clarke, Trenton, Canada.—By this device the door may be readily retained in any position. It consists of a toothed latch bar, raised in any suitable manner, and locked by a slide with a stop pin applied to the end of a swinging lever hinged to the door casing.

IMPROVED BASIN FAUCET.

Edwin S. Rich, New York city.—The compression valve is placed at the end of the pipe to prevent leaking, as the drip water is conveyed directly into the basin, instead of running down the pipe, or between the slab and basin. The nozzle may be unscrewed at any moment from the sleeve when the valve commences to leak, and a new rubber or other packing placed into the seat of the valve.

IMPROVED PRESS BOARD.

Charles H. T. Kruse, Fishkill Landing, N. Y.—An ordinary press board is supported upon blocks or pedestals having a recess in which, when not required for use, a smaller board is deposited. The latter has one side or edge curved to adapt it for use in ironing curved seams of garments. The main feature of the invention, however, consists in forming a slot in one end of said press board, and providing a detachable ironing block adapted to fit in the seat. This block may be adjusted to project above the press board, or beneath it. In the former position it is used in ironing shoulder seams of coat sleeves, etc., and in the latter position, it simply forms part of the smooth surface of the press board proper.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED PADDLE WHEEL.

Richard D. Cauthorn, Waverly, Mo., assignor to himself and William P. Milnor, of same place.—This is a paddle stern wheel, made of two sections with separately revolving shafts, and buckets placed at an angle of inclination symmetrical to the axis of the vessel, to produce, by the separate working of the sections, the turning about of the vessel without the rudder.

IMPROVED FEED WATER REGULATOR.

John Slade, Bay City, Mich.—This is an improvement in the class of feed water regulators in which the pump is continuously operated, and means are provided by which, when a sufficient quantity of water has been at any time supplied to the boiler, the current may be shut off and caused to return to the pump. The invention relates to devices for indicating the hight of water in the boiler. There is also an adjustable connection between the arm of the rock shaft, which is operated by the float, and the arm of the valve by which the entrance of the water into the boiler and return of the same to the tank or immediate source of supply are regulated.

IMPROVED CONSTRUCTION OF SHIPS.

Jules A. D'Hémécourt, New Orleans, La.—The planking is tongued and grooved, and secured by wires running through widthwise in the case of small boats. The wires are pulled taut, and soldered to metal plates fitted to the rim, and the flat bars are flanged or bent over at the top, and secured in any approved way.

IMPROVED STEERING APPARATUS.

Charles R. Suter, St. Louis, Mo. assignor to himself and Elliott E. Furney, of same place.—This consists of one or two winding drums, revolved by suitable power, around which the tiller ropes are wound, when slack merely is taken up by the steering wheel and barrel in steering. The power drums are provided with ratchet wheel and pawl, to admit the use of the apparatus directly from the steering wheel when the driving wheel is not in working order.

IMPROVED MIDDLINGS SEPARATOR.

James Stewart, Atlanta, Ga.—This invention is based upon the fact that under the impulsive force of a current of air the middlings will have greater momentum than the dust or fiber from which they are to be separated, and consists, mainly, in using a fan, so as to move the middlings in one direction, while the dust will be driven out in another at a tangent to the fan.

IMPROVED RAILROAD FROG.

David Y. Payne, Corning, N. Y.—This invention is an improvement upon the combination frog, forming the subject of letters patent No. 138,835, and relates to a certain construction and arrangement of parts, whereby a frog is produced which has advantages in respect to cheapness, durability, and facility of handling and repair.

IMPROVED CARBURETER.

James M. Pollard, New Orleans, La., and Wallace R. Barton, Galveston, Texas.—The chief objects of the invention are, first, to cause the gas to take up, or absorb, the heavier or least volatile portion of the hydrocarbon liquid, and thus avoid leaving a residuum; second, to render the volatilization of the hydrocarbon, and the quantity taken up as vapor by a given amount of gas, more uniform; and, third, to render the carbureter safer in use than those heretofore employed. To these ends, the invention consists in an improved process of feeding or supplying the gas to the carbureting vessel, at or near the point of exit of the hydrocarbon, so that they (the gas and hydrocarbon liquid) will flow through said vessel in opposite directions; in completely surrounding or submerging the said vessel, the reservoir of carbureting liquid, and the gas supply and discharge pipes, with a body of water; and lastly, in combining a liquid seal with the said reservoir.

IMPROVED CRUSHER FOR COKE, ETC.

George R. Root, Indianapolis, Ind.—This consists of a couple of hollow roller drums, having strong bars parallel to the axis, attached at suitable intervals apart for the bars of one drum to mesh into the spaces of the other without quite touching. The coke is fed into the crusher between the drums, which are geared together and revolved by power. The bars are tapered from the outside inward, so that any pieces entering between the outer edges of them will be free to escape to the inside, and thus prevent clogging the bars. The invention also consists of cone-shaped cores within the drums, to cause the crushed coke to escape from one end.

IMPROVED SPIKE DRAWER.

Andrew J. Conway, Salina, O., assignor to himself and Edgar Michael, of same place. This consists of a griping tongs suspended from a toothed bar, which gears with a toothed segment of a lever pivoted to a stand. On the latter is a slideway for the toothed bar. The whole is so arranged that the gripe of the tongs on the spike is increased as the power applied to the lever increases.

IMPROVED PLUMBER'S GRAPPLE.

William H. Dewar, New York city.—This consists in the combination of suitable jaws with rods or tubes in such a way that the aws may be operated in pipes or other narrow places for removing obstructions.

IMPROVED MACHINE FOR REDUCING RAILROAD RAILS TO THE FORM OF PLATES.

James N. Whitman, Pembroke, Me.—The object of this invention is to change T and double-headed rails into flat plates by spreading out or flattening them transversely, without crimping or doubling over their external surface, producing plates homogeneous in texture, and suitable for shovel plates, nail plates, etc.

IMPROVED PADDLE PROPELLER.

William Davenport, Philadelphia, Pa.—This consists of two or more paddle cranks, from which the paddles are suspended and braced by a simple contrivance of stays, supported by one crank and connected to the paddle of another, and the paddles are fluted to enable them to hold the water better than flat ones do.

IMPROVED KEY BOARD FOR TYPE WRITERS.

Philander Deming, Albany, N. Y.—This inventor has lately been giving considerable attention to the improvement of the type writer. His latest device is intended so to improve the key boards of type writers that the sound of the keys is perfectly deadened and the type writer worked without noise, so as to be employed in court and other places, for stenotypic purposes, without annoyance. The invention consists of the key board, provided with a number of layers of cloth, rubber, and similar fabrics, and intermediate washers, fitted to the stems of the keys.

IMPROVED BELL-RINGING APPARATUS.

James W. Coffey, Ellettsville, Ind.—This consists of a double bell hammer, suspended on an axis over the bell. A hammer is placed on each of the two sides, so that when one is pulled down to strike the bell the other rises, preparatory to striking its blow; and each is balanced by the other, so that but very little power is required.

IMPROVED MAIL BAG CRANE.

James A. Boals, Dinsmore, Pa.—This consists of a crane for holding mail bags for the catcher of a running train, contrived so that the arms which hold the bag will drop out of the way of other passing trains and hang by the post as soon as the bag is taken off by the catcher.

IMPROVED PUMP.

Henry Durre, New York city.—This consists of a revolving shaft that imparts rotary motion to two sliding pistons, which are simultaneously reciprocated, so as to move alternately toward or away from each other, and produce thereby a compound action of the valves.

IMPROVED HYDRANT.

William Todd, Portland, Me.—This relates to an improved service pipe and gate for post hydrants, by which the water may be readily shut off from the main pipe and entirely drained off, so as to leave no water in the connecting pipes. It thus prevents the freezing and bursting of the latter. The invention consists of a sliding gate of the main pipe, and of a drain valve of the connecting pipe, that are jointly operated from the top of the hydrant, so that the gate is closed simultaneously with the opening with the drain valve and *vice versa*.

IMPROVED SCREW-CUTTING DIE CHUCK..

John G. Born and George J. Born, Pittsburgh, Pa.—This invention consists of the two parts of a divided screw-cutting die, fixed on slides, which are fitted in a supporting plate and combined with an eccentric and shaft in such manner that the die is opened and closed readily by the eccentric.

IMPROVEMENT IN TIRE TIGHTENERS.

Ensley Martin, Edward N. Davie, and Charles E. Thornton, Rockford, Mich.—This device is composed of adjustable arms and screw blocks, for pressing against the felly, and a post, which is applied to the hub, and provided with guide plates attached thereto, in which said arms are secured and adjusted.

IMPROVED GRAIN SCOURER.

Frederick E. Klopfleisch, Milwaukee, Wis.—This is a mill in which the grain is scoured between the periphery of a horizontal stone and the shell of a surrounding case or curb, so that the grain enters between the stone and the case at the bottom, and is worked upward in the process of scouring, and delivered through a spout which shifts up and down to vary the hight. By this means, the grain is scoured more or less, as may be demanded by grains of different qualities and conditions.

IMPROVED SLIDING CAR FOR RAILWAYS.

John Westcott, Tocoi, Fla.—The object is to cheapen transportation and reduce the first cost of stock. To this end, the invention consists in dispensing with the wheels and trucks of cars, and substituting for them swiveling pedals, which move in channeled rails with a sliding friction from the draft of the locomotive driver upon a separate rail. The rails are channeled for the purpose of containing and guiding the pedals and holding lubricant with which the rails are charged. Dispensing with the wheels and trucks of the cars lessens the first cost, and the easy gliding movement of the pedals in the lubricated channels lessens the wear and tear and cost of maintaining the stock. The invention is designed for elevated railways, but is applicable also to the railways of ordinary gage.

IMPROVED NUT LOCK.

A. J. Potter, Omaha, Neb.—This invention relates to the construction of a staple and provision of elongated coincident slats in the fish plate and out-locking plate of a rail joint, by which said staple is adapted to be inserted in and removed from the slats, and thus, by the operation of gravity, to hold said plates locked together.

IMPROVED SEAL LOCK.

Sylvester J. Tucker, Richmond, Va.—This invention is an improvement in that class of fastenings for freight car doors in which a glass plate or seal requires to be broken, both when the fastening is tampered with or properly opened. The fastening consists of a pivoted hasp bar, which engages with a lug on one of the doors whenever its loop or hasp proper engages the spring catch, or lock, on the other door. The bar may be secured to the lug (which is perforated for the purpose) by means of a padlock.

IMPROVED CAR COUPLING.

John Q. Johnston, Yankton, Dakota Ter.—This consists of two linked-shaped drawbars, folding one within the other, that are fulcrumed to a lateral cross pin, and operated by a fulcrumed front lever. The lever is carried back by the entering of the coupling link bars, so as to close the spread link bars by a longitudinal rod, operating a double elbow lever, fulcrumed to the rear part of the interior link. The inner link bar has a pendent locking pin at the front end, that couples the entering link of the opposite drawbar. The uncoupling is obtained by a cord attached to the lower end of the swinging front lever, while a second cord attached to the lower end of the double elbow lever closes the link bars for coupling.

IMPROVED DIE FOR CAN SPOUTS.

John Gilbert, Newark, N. J.—These are dies for forming curved spouts for oil cans and other uses, which will enable the said spouts to be formed rapidly and neatly, requiring only soldering for their completion.

NEW AGRICULTURAL INVENTIONS.

IMPROVED BEE HIVE.

Orson A. Davis, Sacramento, Cal.—This invention consists, first, of an adjustable entrance gage to regulate the size of the passage to suit the wants of the colony, having perforations to admit air for ventilation when the passages are closed, and so contrived that it can be readily taken away to clean; second, of the construction of the boxes for surplus honey in sections, adapted to be separated with the divisions of the comb, and arranged so that the upper joints serve for comb guides, by which the divisions of the comb will coincide with the divisions of the boxes.

IMPROVED BAG HOLDER.

Gideon Marsh, Steamburg, N. Y.—This consists of two separate main standards, with backwardly inclined upper parts, which are adjusted at suitable distance, according to the width of the bag. The standards are firmly attached to a suitable support by fastening strips and clamping screws, and arranged with top and side hooks for hanging the bag thereon.

IMPROVED HAWK TRAP.

Joseph White, Anderson, Tex.—This trap is so constructed as to adapt it to be attached to a pole or a post set in the ground. The construction is quite simple, and is based on an ingenious arrangement for tripping the jaws.

IMPROVED GRAIN BINDER.

John O. Schuster, Long Prairie, Ill.—This invention relates to a novel construction of a grain binder, and it consists in a set of devices adapted to be placed upon the harvester table in a position to receive the cut grain from the elevator apron, which devices are so constructed as to hold back the accumulating grain until a sufficient gavel has been obtained, when it is admitted to a trough, and then by a series of consecutive movements it is clamped and tied with a wisp of its own straw and the bundle thrown out, the binder being then ready to receive another gavel.

IMPROVED PORTABLE LINT ROOM.

Fielding L. Ellis, Greenville, Ala.—The object of this invention is to provide a portable fireproof lint room, in the form of a car, for carrying the lint from the gin house to the cotton press, and it consists in the construction and arrangement of the car, which is provided with an air vent and a flooding water tank to obviate danger and loss in case of fire, the said car being mounted upon an inclined tramway or track, and connect with the side of the gin house.

IMPROVED SHEEP COLLAR.

James A. Armentrout, Staunton, Va.—This collar is composed of two perforated leather bands or plates, armed with projecting spikes. The perforations allow proper ventilation, and the spikes prevent dogs seizing or holding sheep by the neck, which is the most vulnerable as well as most common point of attack.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED UNDERSKIRT.

Edwin D. Smith, New York city.—This consists of the employment of ruffle, flounce, and binding bands, which are produced by specially weaving them in the breadths required, and in the style and character corresponding to the goods, and without raw edges, and in sewing them on without hemming and binding. A machine with two needles is used, and thus the band is sewn on along both edges at the same time.

IMPROVED COMBINED PORTMANTEAU AND SHAWL STRAP.

Mrs. Diana S. Mathews, Adrian, Mich.—Two or more shawl straps are attached by buckles to the bottom of the portmanteau, to be detachable therefrom or riveted thereto at one side, or to be stationary, as desired; the opposite ends of the straps are secured by buckles at the opposite side, to strap a shawl, overcoat, or any other article of wearing apparel, to the portmanteau, and admit the storage of smaller articles in the case.

IMPROVED FIRE ESCAPE.

Arthur W. Crockett, New York city.—In using this escape a holding rope is secured inside the building, and bars, with the ladder and chute folded upon them, are turned out through the window, the lower end of the ladder and chute dropping to the ground, and the brace bar resting against the wall of the building beneath the window sill. The brace thus holds the ladder and chute out from the wall, so as to clear the blinds, awnings, etc., that may be attached to the side of the building.

IMPROVED POCKET BOOK FASTENING.

Franz F. Weiss, Jersey City Hights, N. J.—This is an ingenious lock consisting of three parts only, and forming a reliable closing device that is adjustable to the expansion or contraction of the pocket book.

IMPROVED SHOE.

Jakob Zwicker, New York city.—This consists of a shoe or gaiter made of a vamp of one continuous piece, with front or back stays attached to a quarter of one piece, provided with a front extension or flap. This gives a shoe without side or back seams.

IMPROVED UNIVERSAL STENCIL PLATE.

Joseph A. David, New York city.—This consists of a stencil plate on which all the letters of the alphabet and numerals are so combined that any combination of them may be made. The stencil plate is provided with space sections at the sides, and top and bottom guide pieces.

IMPROVED PICTURE FRAME FOR FLORISTS.

Diedrich Wilhelmi, New York city.—This consists of the outer base part of a picture frame, with a raised wire or other frame, that forms a space around the frame for arranging and holding flowers therein.

IMPROVED SATCHEL.

Mrs. Euphemia Vale Blake, Brooklyn, N. Y.—The ends are constructed of suitable flexible material, to fold or double inward above the bottom portion, in which they are secured. The sides and ends are constructed with flap pieces of leather, contrived to button together, for the large bag, and to fold down inside to close the bag up in small form. The satchel is provided with a hand strap having a sliding loop, which is made to slide, to provide for variations in the size of the satchel, as when filled, partly filled, or empty.

IMPROVED SPRING BOARD FOR PANTS.

Charles H. T. Kruse, Fishkill Landing, N. Y.—This invention is an improvement in devices for stretching the bottom of pantaloon legs, and imparting to them a certain desired shape. The device is composed of three parts, a sliding wedge, and two formers or forming pieces attached to the wedge in such manner that by adjusting the latter the width of the board is increased or lessened accordingly.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a Line for each insertion. If the Notice exceeds Four Lines, One Dollar and a Half per Line will be charged.

Agricultural Implements and Industrial Machinery for Export and Domestic Use. R.H. Allen & Co., N.Y.

Woodworth Planer, made by Witherby, Rugg & Richardson; Combined Planer and Matcher, cheap for cash. Steptoe, McFarlan & Co., 214 W. 2d St., Cincinnati, O.

Transit for Sale—W. Main, 1909 Pine St., Phila.

A Partner Wanted to take out foreign Patents on a Door Lock, recently patented in the U. S. Address M. C. Hawkins, Edinboro', Erie Co., Pa.

Amateur Scroll Saws, the best.—Address, with stamp, Trump Bro's, Wilmington, Del.

M. Shaw, Manufacturer of Insulated Wire for galvanic and telegraph purposes, &c., 259 W. 27th St., N.Y.

Sun Dial Makers, address W.E. Colton, Marion, Va.

For Sale, together or separately—Two 11 in. hydraulic Presses; Tubular Boiler, new, built by Fletcher & Harrison; Steam Engine, 25 h.p., built by Woodruff & Beach; three sets Hydraulic Pumps. Robert Dillon, 30 Burling Slip, New York.

Manufacturers of Campaign Goods and light Novelties, will find it to their interest to send Samples and Circulars to W. K. Lanphear, Baltimore, Md.

Makers of Tobacco Paper (see p. 23, vol. 35), send address to C. H. C., Box 773, New York City.

Metallic Letters and Figures to put on patterns of castings, all sizes. H. W. Knight, Seneca Falls, N.Y.

Baxter's Adjustable Wrench for first class Mechanics, 62 cents each. Sent by mail on receipt of price. Greene, Tweed & Co., 18 Park Place, New York,

Linen Hose, Rubber lined and unlined, for factories or fire engines, at lowest rates. Greene, Tweed & Co., 18 Park Place, New York.

Makers of Ice and Refrigerating Machines, send Circulars to Alden Fruit Company, 426 Montgomery St., San Francisco, Cal.

Drops for Sale—Very Cheap—One each 250 & 400 lb. Peck Drops—perfect order, with lifters, &c., suitable for sheet metal stamping. Hull & Belden Co., Danbury, Ct.

F. C. Beach & Co., makers of the Tom Thumb Telegraph and other electrical machines, have removed to 520 Water Street, New York.

Bone Mill wanted. W.J. Sanderson, Syracuse, N.Y.

For Sale—2d h'd Woodworking Machinery, Pat. Scroll Saw, made by Cordesman, Egan & Co.; 3-sided Moulding Machine; also Band Saw, Fay & Co., makers. Steptoe, McFarlan & Co., 214 W. Second St., Cin., O.

Pat'd Graining Stencils—J. J. Callow, Clevel'd, O.

Lathe Dogs, Expanding Mandrels, Steel Clamps, &c., for Machinists. Manufactured by C. W. LeCount, So. Norwalk, Ct. Send for reduced Price List.

For Sale Cheap—2 Gardner's Centering & Squaring Attachments for Lathes. Jackson & Tyler, Balt., Md.

Dynamo-Electric Machines for electro-plating and other purposes. Send for illustrated circular. W. Hochhausen, 132 William St., New York.

"Abbe" Bolt Forging Machines and Palmer Power Hammers a specialty. Send for reduced price lists. S. C. Forsaith & Co., Manchester, N. H.

400 new & 2d hand Machines, at low prices, fully described in printed lists. Send stamp, stating just what you want. S.C. Forsaith & Co., Manchester, N. H.

Driving Belts made to order, to accomplish work required. Send full particulars for prices to C. W. Arny, 148 North Third St., Philadelphia, Pa.

Celebrated John Scott Scroll and Jig Saws made to order, of Jessup's superior cast steel, by I. Roberts, 108 Hester Street, New York. Send for circular.

Scientific American—The early Volumes for Sale—very cheap—either bound or in numbers. Address A. F. R., Box 773, New York City.

Hydrant Hose, Pipes, and Couplings. Send for prices to Bailey, Farrell & Co., Pittsburgh, Pa.

Machine-cut brass gear wheels, for models, &c. List free. D. Gilbert & Son, 212 Chester St., Phila., Pa.

"Dead Stroke" Power Hammers—recently greatly improved, increasing cost over 10 per cent. Prices reduced over 20 per cent. Hull & Belden Co., Danbury, Ct.

Power & Foot Presses & all Fruit-can Tools. Ferracute Wks., Bridgeton, N.J. & C. 27, Mchy. Hall, Cent'l.

Shingles and Heading Sawing Machine. See advertisement of Trevor & Co., Lockport, N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution —Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, New York.

See Boult's Paneling, Moulding, and Dovetailing Machine at Centennial, B. 8-55. Send for pamphlet and sample of work. B. C. Mach'y Co., Battle Creek, Mich.

For Sale—Axle Lathe, the very best make. Send for photographs, &c., to Steptoe, McFarlan & Co., 214 W. 2d Street, Cincinnati, Ohio.

Steel Castings, from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills Pittsburgh, Pa., for lithograph, &c.

Hotchkiss & Ball, Meriden, Conn., Foundrymen and workers of sheet metal. Fine Gray Iron Castings order. Job work solicited.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon, 470 Grand Street, New York.

Spinning Rings of a Superior Quality.—Whitinsville Spinning Ring Co., Whitinsville, Mass.

Diamond Tools—J. Dickinson, 64 Nassau St., N. Y.

Temples and Oilcans. Draper, Hopedale, Mass.

Notes & Queries

J. J. will find a recipe for artificial meerschaum on p. 307, vol. 34.—L. M. G. will find a formula for the proportions of a safety valve on p. 363, vol. 29.—G. F. S. will find a formula for the flow of water through pipes on p. 48, vol. 29.—B. will find dircctions for preparing canvas for painting on p. 267, vol. 25.—C. and W. H. I. will find a recipe for a silver-plating solution, for use without a battery, on p. 408, vol. 32.—G. F. B. can fasten emery to leather, and leather to wood, with good glue.—B. L. F. can dissolve glass with hydrofluoric acid. See p. 264, vol. 30.—E. A. S. will find directions for bronzing castings on p. 283, vol. 31.—G, W. C. will find a recipe for Babbitt metal on p. 122, vol. 28.—P. M. S. can solve his cone pulley problem by the formula given on p. 180, vol. 26.—F. E. B. will find directions for scouring brass on p. 54, vol. 32.—B. C. B. will find an explanation of the effect of the moon on the tides on p. 64, vol. 28. The belief that the moon affects the condition of meat is a vulgar superstition.—A. M. is informed that gas retort carbon can be cut with an ordinary saw.—Y. R. will find directions for soldering of all kinds on p. 251, vol. 28.—G. E. B. will find directions for preparing canvas for painting on p. 267, vol. 25.—A. P. R., Jr., will find directions for stereotyping by the paper process on p. 363, vol. 30.—W. T. S. should make a rubber stamp for marking cloth. See p. 156, vol. 31.—N. N. will find directions for getting rid of flesh worms, etc., on p. 233, vol. 31.—F. A. F. will find directions for promoting the growth of the beard on p. 363, vol. 31.—J. S. will find a recipe for the hop yeast cake on p. 234, vol. 30.—G. C. McC. is referred to the Naval Academy for answers to his questions.—H. H. L. will find a recipe for indelible ink on p. 129, vol. 28.—J. M. F. will find directions for extracting impurities on p. 89, vol. 26.—J. S. P. will find directions for galvanizing iron wire on p. 346, vol. 31.—W. H. W. will find a recipe for a fusible alloy on p. 27, vol. 30.—F. W. F. will find directions for removing paint from clothing on p. 75, vol. 30.—P. will find on p. 282, vol. 31, a good recipe for gun cotton. As to nitro-glycerin, see p. 341, vol. 34.—H. E. G. can make white ink for writing on colored paper by following the directions on p. 75, vol. 31.—S. N. C. will find directions for tempering taps, etc., on p. 75, vol. 28. For tempering millpicks, see p. 314, vol. 27.—A. R. H. will find a description of an egg-hatching apparatus on p. 273, vol. 33.—A. H. will find directions for making marine glue on p. 42, vol. 32.—E. N. will find a good recipe for whitewash for outdoor use on p. 133, vol. 34.—W. M. M. will find a recipe for a stove cement on p. 183, vol. 34.

(1) R. A. R. asks: What is the variation of the magnetic needle at this point, about latitude 32° and longitude 91°? A. The best way is to determine it experimentally. See Loomis' "Trigonometry and Logarithms."

(2) B. B. says: Where can I find tabulated variation of magnetic needle courses from the true meridian, for the last century, in Central New Jersey? A. We understand that the most complete statement of the results of American observations on the magnetic elements has been published by Dr. Bache, in *American Journal of Sciences*, (2) XXIV., p. 1, where all the earlier observations are collated, with the more extended result of the coast survey, with maps.

(3) L. P. D. says: 1. What size of box will it require to enclose the steel band or spring by which Mr. Leveaux has succeeded in getting a draft of 3,000 lbs.? A. The boxes used by Mr. Leveaux are each 14 inches in diameter. 2. What is meant by a draft of 3,000 lbs.? A. The draft of the spring is the force in lbs. which it exerts in unwinding. Mr. Leveaux proposes to wind up his springs with steam engines. By using several springs, he expects to be able to propel as large a car as is required.

(4) L. H. P. says: 1. I am making an electric engine, as described on p. 301 of the SCIENTIFIC AMERICAN SUPPLEMENT, by Mr. Sawyer. The magnet is made of 1 x ⅜ inch Ulster iron. How many feet and what size of wire will I need to wind on it? A. About 20 feet of No. 16, or a couple of hundred feet of No. 20. 2. Does it make any difference which way I wind it? A. No, provided the connections are made in such a way that the upper ends of the magnet are of opposite polarity. 3. What kind of battery is the best? A. One cell of Grove if the large wire is used, or two of Daniell's battery if the small wire is preferred. See any schoolbook on natural philosophy. 4. Are all the parts to be insulated from the table on which it rests? Would a stand made of plate glass be the best? A. Convolutions of wire should be insulated from each other; this is best effected by using silk or cotton covered wire. A wooden base will answer. 5. Would light brass springs answer in place of mercury cups? A. Yes.

(5) C. N. M. says: You state that Dr. Joule's powerful magnets were wound in the direction of their length. Please explain how this was done. A. The wire was wound around the iron in the direction of its longest dimension, from end to end, instead of around it laterally, as is usually done for small magnets.

(6) R. & Co. ask: What is the difference in the method of galvanizing wrought and gray or cast iron? A. The iron is cleaned by diluted acid and friction, is heated and plunged into a bath of melted zinc covered with sal ammoniac, and is stirred about until the surface becomes alloyed with zinc. Mallett recommends an amalgam of zinc, 2,292, mercury, 202, and about 1 of sodium or potassium; this melts at 680° Fah. The cleansed iron is dipped in this and removed as soon as it reaches the temperature of the alloy. Wrought and cast iron may both be treated in this manner.

(7) A. W. T. says: If 1 cubic foot of gas, at 100 lbs. to the square inch pressure, be liberated into a receiver capable of holding 3 cubic feet, would the pressure of the gas be 50 lbs. to the square inch? In other words, does the elastic pressure of a certain weight or quantity of gas vary uniformly as its volume? A. This law is as you state it, if the temperature of the gas is kept constant.

(8) J. V. R. says: I have made an induction coil mostly from instructions gained from the SCIENTIFIC AMERICAN; it is capable of throwing a spark 6 inches. From reading No. 17 of your SUPPLEMENT, I proceeded to lengthen and strengthen the spark from instructions therein contained, and failed. I made the attachments as you recommend in your article this week; but it would not work. What was the cause of the failure? A. Your previous question was not fully understood. We think a better plan is to attach the secondary wires to the inside and outside castings of a Leyden jar of considerable capacity. This will increase the volume of the spark, but it is not likely to lengthen it much. The plan is used in studies with the spectroscope.

(9) C. B., of Holaa Hauai, Sandwich Islands, asks: Can you give me a plan by which, in plowing with 4 horses abreast, the tension will be equal and the plow in its proper place, and yet 3 of the animals will travel on the unplowed land and one in the furrow? A. Some of the farmers who take our paper can perhaps answer this correspondent. If so, we would be glad to hear from them.

(10) A. B. J. says: In your paper of March 25, 1876, you give a recipe for a new nickel-plating solution, which you say gives beautiful results. This recipe seems to be indefinite, and I would be very much obliged for a lucid explanation of it. There are two solutions mentioned. The first of these is easily understood, but I cannot understand how to make the second solution, as I do not see how ½ oz. nickel can be dissolved in 2 ozs. cyanide of potassium in 1 lb. of water. And again, after the solutions are mixed, is there to be any water added? If so, what quantity? A. The half ounce of metal for the second solution is dissolved in aqua regia, the same as for the first. The acid is then driven off by heat and the pasty mass redissolved in a solution of cyanide of potassium and water (2 ozs. cyanide to 1 lb. water). No more water need be added.

(11) W. A. W. asks: I wish to evaporate liquids by steam heat. How much pipe surface will it take to evaporate 1 cubic foot of water per hour after the temperature of the water has been raised to the boiling point, the steam pressure being maintained at 60 lbs. to the square inch? A. We think that from 10 to 12 square feet will be sufficient.

(12) J. F. A. says: I heard a man say that a pump would work easier if the bottom of the suction pipe was only just covered with water than it would if it were at the bottom of a great depth of water. I differ with him, and I can prove that it will not, if the suction pipe and discharge pipes are of the proper area for the cylinder. Take, for example, a quantity of water 20 feet in depth, with the surface of the water 15 feet above the vacuuum in the pump. I claim that the water will find its way into that vacuum at every stroke, if there were no atmospheric pressure acting on the water, showing that a pump will work as easily with the bottom of the pipe at the bottom of the water, as it would if it was only just covered with it. A. We think there would be a slight difference in favor of the arrangement proposed by your disputant, principally because, the water passing through a shorter length of pipe, there would be less friction.

(13) J. W. P. asks: Does a propeller wheel, submerged, do its work of propelling the boat during its entire revolution, or only for half of it? A. Throughout the whole revolution. Its action is somewhat like that of a screw advancing into a nut, as it is turned.

(14) W. H. B. asks: 1. What is commonly understood by the expression "press equally in all directions," when using it in speaking of the action of steam or other fluids? Is it so much pressure to the square inch of surface acted upon? A. Yes. 2. If so, in what does the evidence consist of the truth of it? A. It is most simply proved by experiment. 3. When we say that a man can raise so much weight, do we mean to say that his force (or weight) applied at the end of one arm of a lever (or its equivalent) will balance the weight raised? A. Yes. 4. Does weight alone give water its downward pressure? A. Yes. 5. What natural law does water follow in seeking its level? A. It moves under the action of force until this force is balanced. 6. Is what is termed the hydrostatic paradox easily explained by known natural law? A. Yes. 7. What is the law? A. That the pressure of a column of water is equal to the weight of a prism of water having the same base and altitude as the given column.

(15) M. M. says: Please find sample of a crust that forms in my boiler. Can you tell me what will prevent it? I use well water, and it tastes strongly of sulphur. A. It is a lime deposit. We doubt whether you can entirely prevent the formation if you continue to use the present feed water; but the use of a good heater will be advantageous.

(16) M. M. asks: Would borax make a good addition to a dentine? A. No.

How is precipitate of lime made? Precipitate any soluble salt of lime by addition of an alkaline carbonate.

(17) D. B. T. asks: What force would be necessary to support a body in mid air, so that it would neither fall nor rise, but be supported in equilibrium? A. A force equal in intensity to the weight of the body.

(18) E. H. says: There is a cast iron cannon in our town made in 1822, which will shoot a 9 lbs. ball. It used to sound well, and make a loud report; but for the last year or two, it seems to have lost its ring or clear loud report. It sounds dead, when the same amount of powder is used as formerly. A. If you have correctly stated the particulars, we do not feel able to explain the matter. In general, we should imagine that in such a case the quality of the powder rather than the gun had deteriorated. Possibly, however, there may be other reasons; and perhaps some of our readers can furnish them.

(19) C. A. asks: What pressure of steam per square inch will be necessary in a double kettle to keep sugar sirup boiling at 350° Fah.? A. About 125 lbs. per square inch, by gage.

(20) J. R. P. asks: 1. What is the strength of a good Manilla rope 1 inch in diameter, and also of one 1¼ inches in diameter? A. One inch rope, about 3,000 lbs.; 1¼ inch, about 4,500 lbs. 2. What is a four fall tackle block? A. We believe the term has no precise definition, but commonly refers to a tackle with two blocks, each having 2 sheaves. 3. How much weight can be safely raised with an inch rope in a good tackle block, say with 3 pulleys in one and 2 in the other, and how much with a rope 1¼ inches diameter in a like block? A. It will depend somewhat on the rigidity of the cordage and friction of sheaves but the maximum safe weights will be about 7,500 lbs. for the 1 inch rope, and 11,000 lbs. for the 1¼.

(21) C. M. says: There have been lately many storms and tornadoes in this and in foreign countries. Does our present mode of telegraphing help to create these storms? A. No. On the contrary, so far as the telegraph lines have any effect, it is to lessen the violence of electric storms by carrying the fluid to the earth and thus tending to bring about an equilibrium.

(22) J. L. W. says: We have a siphon of 2 inch pipe from a canal to a tank about 100 feet distant. The top of the tank is a few inches above the water in the canal, and the pipe enters the tank near the bottom, which gives it a fall of about 5 feet (the tank being 6 feet deep) at the start, and is intended to keep the water in the tank on a level with the water in the canal. Sometimes it stops and has to be started again with a pump. Will you explain the cause of this? A. Observe the hight in the tank when the siphon stops working, and insert a waste pipe just below this level. There should be a valve at the highest point of the siphon, to let out the air that accumulates from time to time.

(23) A. D. B. asks: What substance can I use to make a watertight flooring over a plank floor? The floor is of two inch yellow pine plank and very stiff; it is in the second story of a building, and so exposed to the air beneath, it is soaked with water two or three times a day. There is no wheeling or rolling of heavy articles over it, only persons walking. Would a concrete 2 inches thick of cement and coarse sand do, or would it crack? I would prefer a slightly elastic flooring. A. If there is not much wear upon it, why not take sheet lead?

(24) P. G. asks: Is there any known way to purify the gas made by gasoline machines, so as to obtain a steady light, equal or nearly so to coal gas? A. If the machines are properly constructed, they should give a good steady light fully equal to that of coal gas. The gas (or vapor) does not require purification.

(25) E. T. D. asks: Would a battery made of an iron cylinder 10 inches deep and 3 feet in circumference, and a lead one 10 inches deep and 15 inches in circumference, charged with common salt, give enough current to heat a small platinum wire to white heat? A. You had better use zinc and copper instead of lead and iron. Salt will answer to charge the batteries with.

(26) O. R. M. asks: 1. On what principle is an electric engine constructed? A. Various forms are made, but they depend upon the alternate magnetization and demagnetization of soft iron cores and the consequent attraction of other soft iron pieces placed within their influence. The moving piece or parts are provided with attachments called commutators, by means of which the battery connection is made and broken at the proper moment. 2. Is it possible to store electricity up in any manner so that an engine can be run without the batteries being present? A. No, not in the sense you mean. Magnetic machines are made to run by steam power and give powerful currents, but it would be a great waste of power to use them as motors. 3. Is it possible to construct an electric engine of any large power, say 1 horse power? A. Yes. 4. Is the power of the engine dependent only (within limits) on the strength of the current? A. The strength of the current is only one of the factors on which the power of the machine depends. 5. In that case, could not a powerful engine be constructed within a small space? A. Motors capable of running sewing machines can be made to occupy but little space, but for much power their proportions become more considerable.

(27) O. K. says: If of two pulleys, one be 20 inches in diameter, making 190 revolutions per minute, the other being 6 inches in diameter, what is the rule for finding number of revolutions of smaller pulley? A. Divide the speed of belts in feet per minute by the circumference of the pulley in feet.

(28) J. J. says: 1. A great many people, contemplating building concrete houses from your directions, would have many things to learn yet. In preparing the sand and gravel, would not two screens, one above the other, do, first putting the earth as it comes out of the bank, containing gravel, sand, and loam, on the upper screen, that which remains after shaking being gravel, the balance passing down to the lower screen which, on being shaken, would pass the finer dirt or sand through it, and that which remains being sand? Would this mode be sufficient to prepare the sand and gravel? A. There are sand beds where the sand is found of a very even grade of fineness and purity, and it would be better if possible to take it from these beds; and the same is true in reference to the gravel. If these beds are not to be found within a convenient distance, the sand may be screened from a gravel bed as you suggest. 2. How fine should the screens be? A. For the sand $\frac{1}{16}$ of an inch, but what is left in front of the screen may be taken for the gravel without further sifting. If not entirely free from loam,

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the sand, and also the gravel, should be washed. 3. Dr. Youmans says: "Beach sand will attract dampness." How is this? A. Because of the salt with which it is more or less impregnated. 4. In the absence of broken stone and the like, will gravel and sand do? A. Yes, if the gravel is of good size. 5. Will such a wall be damp? If so, would it need furring, or should it be hollow, as recommended by Gilmore, in his work on "Mortar and Cements"? A. Yes, it would need to be protected on the inside in some way against the condensation of water from the air in winter. 6. How are the parts proportioned, by weight or measure? A. By measure. 7. Drs. Chase and Youmans recommend freshly burnt lime; you recommend cement. If lime, being cheaper, will do, no one will use cement or water lime (which, I think, is the same). Suppose we take ⅔ freshly burnt lime and ⅓ water lime, how will that do? A. Pure cement of the best quality should be used. We presume that this is what you mean by "water lime." No common lime should be mixed with it if you want a permanent wall. 8. In using cement lime, are the proportions taken before slaking or after? A. Before. 9. How are sills, caps, and cornices made? A. These may be cast in molds.

(29) S. A. & S. ask: What will prevent the forming of vitriol crystals on the outside of telegraph battery jars? We use stone jars, which become entirely coated on the outside in a short space of time. A. A good way to prevent the fluid from creeping over the tops of the jars and crystalizing on the surface is to paint the top of the jars for half an inch.

(30) R. S. asks: What is the solution used by sugar refiners in the centrifugals to give to sugar the bright yellow straw color? A. This color, we believe, is obtained during the bleaching process, and sometimes by the addition of small quantities of dye stuffs, such as turmeric, etc.

(31) W. R. says: I. In a Holtz induction machine, where the revolving plate is supported by a thick glass plate, held horizontally between two insulated plates, of what material is it best to make the axle of the revolving plate? A. Wood and glass are frequently used. Perhaps an ebonite axle would answer best. 2. If ebonite be substituted for this horizontal glass plate, can as good electrical results be obtained? A. We believe some experimenters give ebonite the preference. 3. If coatings of paper or foil be attached to the sector plate, and these have projecting rows of pin points, and the edges that hold these pin points are opposite collecting combs of conductor, is it necessary to have windows or holes cut in sector plate to relieve the bound electricity? A. In the improved Holtz machine neither windows nor armatures are used. Two plates are mounted horizontally and both revolve, the direction of one being opposite that of the other. Four collecting arms are placed, at equal distance apart, around the plates, two above the upper and two below the under plate, and the order alternating, so that if the first is an upper arm the next is under, and so on. The first upper and under arms are connected metallically, as are also the third and last. Sometimes also an extra arm is used, which brings an upper and under arm together in one place. This arrangement appears to improve the action of the machine. 4. To steady the revolving plate, should its edge or circumference rest or turn in grooved pulleys, fastened on the small wooden pillars or posts that support the sector plate, these posts passing from horizontal supporting plates to sector? A. Grooved pulleys are best, unless, as is often done with the old style machines, the fixed plate is perforated at the center, and the revolving plate mounted on an axis passing through it.

(32) D. W. W. asks: What substance can I use to illuminate the dial of a watch sufficiently to show the hour in the dark? Will the small glass tube with phosphorus and oil do? A. We do not consider it practicable nor advisable to attempt the application of the phosphor lamp in the way you mention.

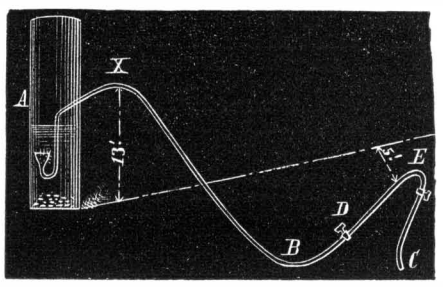
(33) N. S. W. asks. Is the first six months (vol. 1) of the SCIENTIFIC AMERICAN SUPPLEMENT furnished bound? If so, price? A. We furnish the first volume of SCIENTIFIC AMERICAN SUPPLEMENT, stitched in paper covers, for $2.50. In boards, $3.50. Probably few persons appreciate the great scope and remarkable cheapness of the work we are carrying on under the title of our SUPPLEMENT. The first volume, lately completed, is illustrated by over 1,000 engravings and figures, covering all the most recent and interesting scientific information of the day. It includes the history and progress of the Great Exhibition. The contents of the SUPPLEMENT are arranged in such compact form, and embrace such an enormous variety of subjects, that if printed in ordinary book form they would occupy 3,600 pages, or 7 volumes of 500 pages each. In the domain of Science, nothing comparable to the SCIENTIFIC AMERICAN and SUPPLEMENT, in the matter of economy of price, has heretofore been given to the public.

(34) P. F. asks: How can I dissolve soda in oil? A. You do not state what kind of oil. Except in the fatty oils, containing free glycerin or acids, it is nearly insoluble. In any case, an elevated temperature increases solubility.

(35) W. E. H. says: A friend of mine recently bought me a piece of glass tubing of ⅜ inch internal and ¾ inch external diameter, about 1 foot in length. He stated that it formed part of a gage tube to show the hight of water in a mill flume, and that, getting dirty, the engineer in charge took it down to clean it, which he accomplished by wiping with waste and emery flour on the end of a pine stick. The tube, which had been in use for years, was then laid down in the engine room temporarily, when in a few hours it broke spontaneously into a dozen pieces. The fractures are nearly all alike, running a short distance lengthwise and then directly around the tube, cutting it off. I took the piece he gave me; and after cleaning with water and drying it, I laid it on a bench with a piece of iron wire and another of brass wire laid loosely through the tube. In a few hours it broke into three pieces, and in the course of the next night into half a dozen pieces, all the fractures having the direction as stated above, and some of the pieces being interchangeable on account of the striking similarity of the ends. To ascertain whether imperfect annealing had to do with the breaking, I took a piece two inches long under the blowpipe and heated it so hot that it flattened by its own weight, without any tendency to fly to pieces. A. These tubes are usually made of the hardest glass, and carefully annealed; but from the fact of your ability to soften the tube as you represent, it appears to have been otherwise in this particular case. There may have been flaws in the glass, which were further aggravated by the careless use of emery or otherwise, but we think it probable that there were some facts connected with this peculiar breakage which you have failed to discover or mention.

(36) J. I. asks: What is the best cheap solvent for ordinary tar? A. Benzine.

(37) R. M. says: I take water by siphon from a well distant from my house about 950 feet. I first laid ½ inch lead pipe, through which the water flowed nicely for a year or more, when the pipe was burst by frost. After repairing it I could never get it to work satisfactorily. With a view to improving it, I substituted a ¾ inch pipe from the well, A, to the lowest part of the siphon, B, the ½ inch pipe from that point to the house being in good condition. I now find that, by filling the pipe by either force or suction, the water will continue running for from ½ an hour to 12 hours, when it stops. I sometimes imagine that it runs only long enough to allow what water there may be in the pipe from upper part of siphon to the outlet to flow out. I wish to ascertain if you can suggest where the defect is, and give the remedy. The pipe is perfectly airtight. I have thought that by using a ½ inch pipe from well to the highest point of the siphon, X, the difficulty might be overcome. The water has to rise from bottom of well to this point about 13 feet. I have a fall of 5 feet from bottom of well to the highest point of discharge, E. I have experimented and thoroughly exhausted all the local hydraulic knowledge, and now apply to you. Can you tell me what further means I can try with it? A. The end of the pipe at the strainer in the well may be stopped up with dirt, or there may be some obstruction in the end at the house. If this is not so, it would seem to imply that the pipe is not airtight; this point should be tested thoroughly. Sometimes air bubbles from the water will collect at the highest point of the siphon, and trap it there, but this is not likely to occur in so short a time; the probability is that the pipe either leaks or is stopped up.



MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

E. C.—No. 1 is a piece of slate with chalcopyrite, sulphide of copper, and protoxide of copper. No. 2 is coal.—G. V. H.—It is iron pyrites in clay.

J. C. M. says: I have seen a musical instrument in which the sound was produced by a crank in the end of the instrument, the notes being produced on keys along the side. How is the inside of the instrument arranged?—J. G. W. asks: What is the construction of the Langstroth beehive?

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Ornamental Machinery. By E.
On a Theory of Electricity. By J. N. L.
On a New Electric Battery. By W. R. H.

Also inquiries and answers from the following:

W. B. A.—G. B.—E. B.—A. L. F.—W. G.—C. H. C.—C. H. B.—E. B.—G. W. D.—F. S. D.—H. S.—G. H.—R. R.—L. F.—A. T.—H. P.—W. S. V.—G. W. D.—E.—T. H. L.—W. E. F.—W. S.—H. S. W.—B. R. H.—H. C. R.—G. B. Y.—J. M. N.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who makes carbons for batteries? Who sells gutta percha? Who sells incubators? Whose are the best leather belts? Who makes the cheapest photographic apparatus?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL]

INDEX OF INVENTIONS

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July 18, 1876,

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[Those marked (r) are reissued patents.]

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9,394.—TYPE.—J. M. Conner, Greenville, N. J.
9,395.—CARPET.—E. Daniel, Paris, France.
9,396.—STATUE.—J. W. Fiske, New York city.
9,397.—CARPETS.—J. Hamer, Dutchess county, N. Y.
9,398 to 9,400.—TYPE.—H. Ihlenburg, Philadelphia, Pa.
9,401.—TYPE.—A. Little, New York city.
9,402.—CARPET.—T. J. Stearns, Boston, Mass.
9,403, 9,404. — EMBROIDERY.—E. Crisand, New Haven, Conn.

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The inexperienced purchaser of a patent does not generally appreciate the importance of having its claims examined, and their validity and scope defined by some person experienced in such matters, before parting with his money. It is not unusual for the assignee, just as he is commencing the manufacture of articles under his recently purchased patent, to find that it is an infringement upon some previously issued patent, and that he has not only made a worthless investment, but that he is likely to get mulcted in damages if he proceeds with his manufacture. Cases are continually coming to our knowledge wherein parties have made purchases in good faith, and paid considerable sums of money on the assurances of the patentee and a mere glance at the patent, presuming that all that the drawing of the invention showed was protected by the claims, when, in fact, the point covered was almost infinitesimal. Another manner in which purchasers are sometimes deceived is that the claims, although broad enough and worded properly to cover the invention, contain a single element protected by some prior patent, which covers the very part in the new machine which is necessary to insure its efficiency. The Howe sewing machine patent illustrates this. It protected but little that any of the manufacturers cared to use, except the one small part essential to all sewing machines; and all manufacturers had to pay Howe a royalty, and he derived from that apparently trivial item an immense income.

We therefore recommend any person who is about to purchase a patent, or about to commence the manufacture of any article under a license, to have the patent carefully examined by a competent party, and to have a research made in the Patent Office to see what the condition of the art was when the patent was issued. He should also see that the claims are so worded as to cover all the inventor was entitled to when his patent was issued; and it is still more essential that he be informed whether it is an infringement, as above suggested, or not. Parties desiring to have such searches made can have them done through the Scientific American Patent Agency, by giving the date of the patent and stating the nature of the information desired. For further information, address MUNN & CO.,
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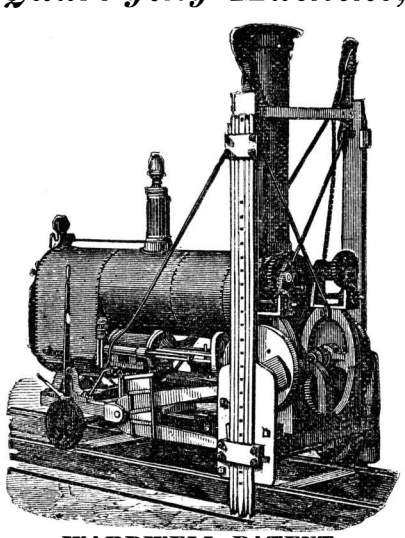

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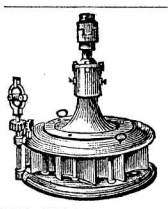

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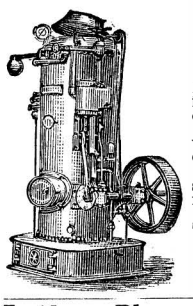

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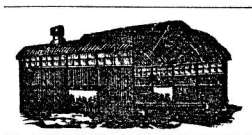

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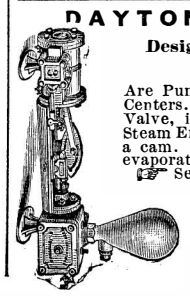

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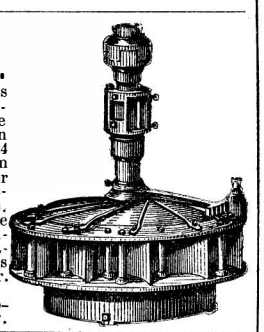

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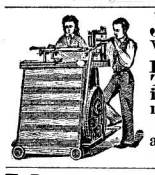

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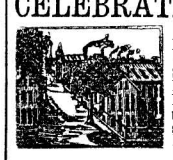

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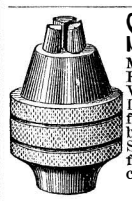

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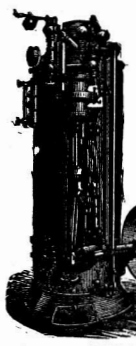

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—:o:—
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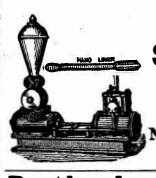

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